

HOW THE FLYING BATHTUB GOT ITS NAME

AIR & SPACE

Smithsonian

HE CAN FLY!

BUT CAN HE LAND?

**New York's
Airfield of
Dreams**

(P. 36)

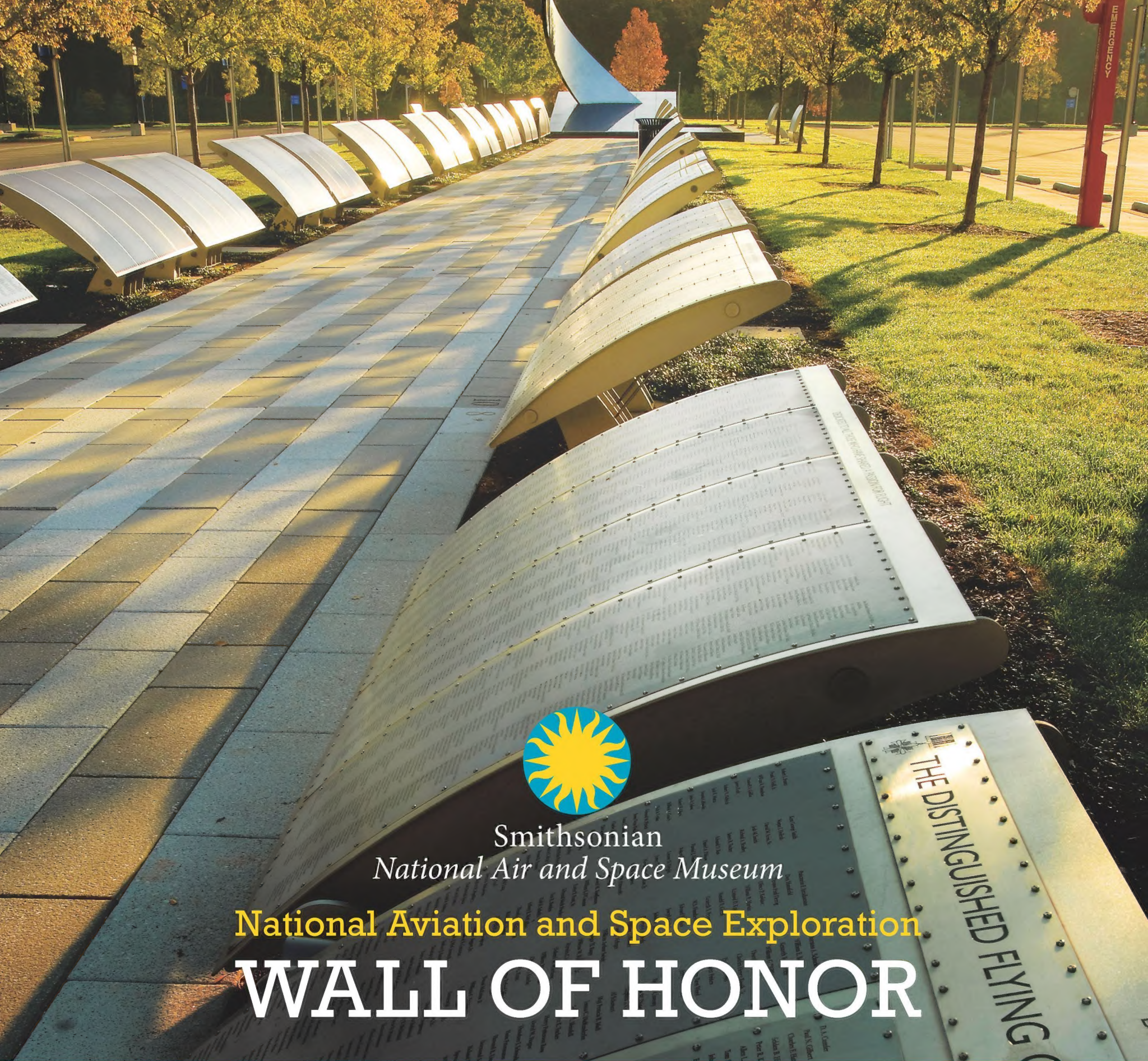
**Poor, Pummeled
P-63 Pilots** (P. 50)

**Goodbye, Shuttle:
Stories from Those
Who Launched It**

**LANDING
IN HELL**
(OK, Venus.
Same thing.)

Wing Suit Glider
Jeb Corliss

NOVEMBER 2010



Smithsonian
National Air and Space Museum

National Aviation and Space Exploration WALL OF HONOR

Here's a unique way to recognize that special Veteran ...

This Veteran's Day, help complete the Steven F. Udvar-Hazy Center by contributing \$100 or more and your name, or the name of someone you wish to honor, will be seen by millions of visitors for generations to come.

You will also receive a handsome Certificate of Registry suitable for framing and have the opportunity to submit a Wall of Honor profile to the Museum's database.

To make a Wall of Honor donation, visit www.nasm.si.edu/wallofhonor

If you have any questions, contact the National Air and Space Society
Membership Office at nasmwallofhonor@si.edu or 202.633.2603.

**It's hefty. It's gold.
It's a great price. What a country.**



*Shown larger than actual size
of 27 mm in diameter*

Our buyers just discovered one of the most significant European Bank hoards of U.S. gold in years. They secured only a few magnificent U.S. gold coins guaranteed to be over 100 years old. The vintage coins in this hoard represent dates ranging from 1866 through 1907 that uniquely represent the history of our nation in fine gold.

Uncirculated Gold Coins from the Past are Timeless Treasures

Each of these \$10 Gold Liberty coins is certified in Uncirculated Condition. As gold values have soared with unpredictable oil prices and the falling dollar, you may never again have the opportunity to own these gold coins at this price. Demand for these coins continues to escalate as collectors scramble to scoop up U.S. gold coins for their gold content and scarcity.

Certified genuine uncirculated U.S. gold coins have historical and numismatic value that bullion gold cannot match, making these coins even more attractive.

Don't Miss This Opportunity: Order Now!

Consider that the number of U.S. coin collectors has sharply risen to over 50 million today, you may never get a second chance to take advantage of this opportunity. Order now while our limited supplies last. Buy more and save! Due to our limited supply of these coins, we must issue a strict limit of 5 coins per customer. Why pay \$900 or more for similar coins? Prices and availability subject to change, so call today. Your satisfaction is assured by our 30-day money-back guarantee.

Order More & Save

	\$ per coin	shipping	total
1 Liberty Coin	\$895	\$15 S&H	\$910
3 Liberty Coins	\$875	FREE!	\$2,625
5 Liberty Coins (max)	\$850	FREE!	\$4,250



NEW YORK MINT

5577 West 78th Street
Edina, MN 55439

1-800-473-1745 Ext. 3401

THE VISIONARY'S WATCH

No other watch is engineered quite like a Rolex. The Milgauss, introduced in 1956, was designed to meet the demands of the scientific community and is capable of withstanding magnetic fields of up to 1,000 gauss. After rigorous testing by CERN engineers, it earned a reputation as the perfect magnetic shield. Today's Milgauss features a Parachrom hairspring that provides additional protection from the effects of magnetism. The Milgauss, exclusively available in 904L steel, is presented here in its Anniversary Edition with a unique green sapphire crystal.

THE MILGAUSS



FOR AN OFFICIAL ROLEX JEWELER CALL 1-800-367-6539.
ROLEX OYSTER PERPETUAL AND MILGAUSS ARE TRADEMARKS.
NEW YORK


ROLEX
ROLEX.COM

AIR & SPACE

Smithsonian

ON THE COVER: That's Jeb Corliss in the wing suit (p. 24) diving into the clouds toward southern California, but who's taking the picture? Professional skydiver and aerial photographer Craig O'Brien, also in a wing suit, exited a de Havilland Twin Otter with Corliss and stayed with him just long enough.



FEATURES

24 Jump. Fly. Land.

BY CARL HOFFMAN

So far Jeb Corliss has mastered two out of three.

30 Flying Bathtubs Sell Like Hotcakes

BY GILES LAMBERTSON

How a little sport like the Aeronca C-2 grew important enough to hang in museums.



36 Brooklyn's Jewel: Floyd Bennett Field

BY DAVID SHAFTEL

It was once Aviation Central. Then it became a ghost town. Can the National Park Service bring it back to life?

38 Throttle Down

BY TOM HARPOLE | PHOTOGRAPHS BY DAVID BURNETT

For 30 years, residents of Florida's Space Coast welcomed the roar of space shuttles. Now they brace for the silence.

AIR-TO-AIR: BULLETS & MISSILES

50 Just Shoot Me

BY JAMES DUNAWAY

In World War II, P-63 pilots had to learn to take it—and not take it personally.

54 Sidewinder

BY PRESTON LERNER

Why today's military pilots can fire and forget.

62 Forbidden Planet

BY SAM KEAN

The solar system's least likely tourist attraction may soon receive a visitor from Earth.

68 Thrills! Chills! Mystery in the Air!

BY REBECCA MAKSEL

In the 1930s, Hollywood turned pilots into movie stars.



DEPARTMENTS

- 2 Viewport
- 4 Letters
- 10 Soundings >>
- 16 In the Museum
- 20 Above & Beyond
- 22 Oldies & Oddities
- 72 Sightings
- 74 Reviews & Previews
- 78 Credits
- 79 Forecast
- 80 Moments & Milestones



Editor	Linda Musser Shiner
Art Director	Ted Lopez
Executive Editor	Paul Hoversten
Senior Editors	Tony Reichhardt Patricia Trenner
Senior Associate Editor	Perry Turner
Associate Editors	Michael Klesius Rebecca Maksel Diane Tedeschi
Photography and Illustrations Editor	Caroline Sheen
Researcher	Roger A. Mola
Editorial Intern	Mary McKillop
Founding Editor	George C. Larson

CONTRIBUTING EDITORS

Roger Bilstein	W. David Lewis
William E. Burrows	Eric Long
Tom Crouch	Stephen Maran
David DeVorkin	Laurence Marschall
Freeman Dyson	Ted Maxwell
Daniel Ford	Marshall Michel
Greg Freiherr	Ron Miller
William Gregory	Brian Nicklas
Dan Hagedorn	James Oberg
R. Cargill Hall	Dominick Pisano
Richard Hallion	George Robinson
Jim Hansen	Chad Slattery
Gregg Herken	Marcia Smith
Nick Komons	Stephan Wilkinson

Editorial: (202) 633-6070

e-mail: editors@si.edu

Web site: airspacemag.com

Air & Space/Smithsonian; October/November 2010; Vol. 25, No. 5
Air & Space/Smithsonian published an extra issue in September 2010. Subscribers will still receive 6 or 12 issues as part of their paid subscriptions; however, membership expiration dates may move. *AIR & SPACE/Smithsonian* (ISSN 0886-2257) is published bimonthly by Smithsonian Enterprises, MRC 513, PO Box 37012, Washington, DC 20013-7012. We may occasionally publish extra issues. Periodical postage paid at Washington, DC, and additional mailing offices.

POSTMASTER: Send change of address to *AIR & SPACE/Smithsonian*, PO Box 62080, Tampa, FL 33662-0808. Printed in the USA. Canadian publication agreement no. 40039324. Canadian return address: Brokers Worldwide, PO Box 1051, Fort Erie, ON L2A 6C7 Canada.

©Smithsonian Institution 2010. All rights reserved. Reproduction in whole or in part without permission is prohibited. Editorial offices: MRC 513, PO Box 37012, Washington, DC 20013. Circulation and advertising offices: 420 Lexington Ave., New York, NY 10170.

SUBSCRIPTIONS: U.S. and possessions: \$26 a year payable in U.S. funds. Canada and all other countries: add \$6.00 (U.S. funds) per year. Ninety-nine percent of dues is designated for magazine subscription. Address changes and subscription orders: Mail to *AIR & SPACE/Smithsonian*, PO Box 62080, Tampa, FL 33662-0808; call (800) 513-3081; outside the U.S., call (813) 910-3609.

MAILING LISTS: We sometimes make our subscriber list available to companies that sell goods and services that we believe would interest our readers. If you do not want to receive such mailings, send your current mailing label or, an exact copy, to: *AIR & SPACE/Smithsonian*, Mail Preference Service, PO Box 62080, Tampa, FL 33662-0808.

SINGLE COPIES: To purchase an issue (current \$4.99, back issue \$7), please write *AIR & SPACE/Smithsonian*, 420 Lexington Ave., Suite 2335, New York, NY 10170, or call (212) 916-1300.

The Muse in Museum

GLACIER GIRL, a 1942 Lockheed P-38F Lightning, lifted piece by piece from deep within a Greenland glacier and precisely restored, is probably the most famous airplane flying today. For the past four years, its current owner (and National Air and Space Museum board member), Rod Lewis, has displayed the aircraft at airshows around the country, where it always draws crowds. *Air & Space* magazine published a cover story about its ill-fated World War II mission and later restoration, which you can read in the magazine's archive at airspacemag.com. Now visitors to the National Air and Space Museum can hear the story from Bob Cardin, the man who has been with *Glacier Girl* for 18 years, from the day it emerged from the ice, through its 10-year restoration, to its recent airshow tours. Bob will speak about the legendary P-38 at an evening lecture on October 6.

We are fortunate to be able to host someone like Bob, whose experience, knowledge, and passion for this airplane can enlighten the rest of us. He joins an impressive group of people who have lectured at the Museum: We've learned about aerobatics from airshow great Bob Hoover, about the airline business from airline executive Herb Kelleher, about the Apollo 8 mission from the astronauts who flew it, and about life as the first female U.S. Air Force Thunderbird pilot from Nicole Malachowski. You can view their lectures on the Museum's Web site: nasm.si.edu.

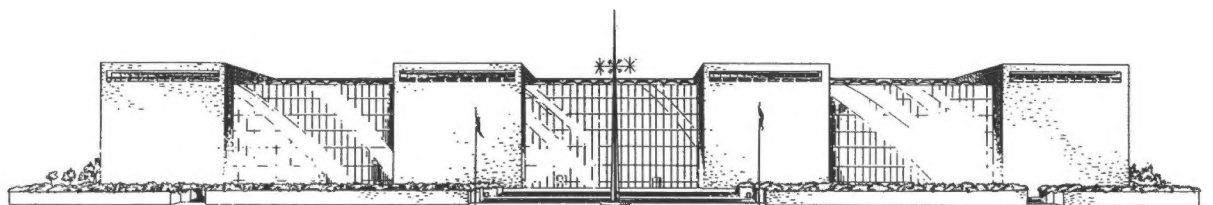
When distinguished leaders and aviators like these visit us, they elevate

our Museum beyond a mere building for displaying objects to a center of learning. They restore the original sense of "museum"—a shrine dedicated to the Muses—and make the Museum a place of inspiration.

Our resident experts also foster the Museum's ability to educate and inspire. Every Wednesday at both the Museum on the Mall and the Steven F. Udvar-Hazy Center in northern Virginia, curators give brief talks, usually on one of the artifacts in the collection. Forthcoming topics include the Lockheed Sirius *Tingmissartog*, which Charles and Anne Morrow Lindbergh flew to the Far East in 1931 and on 1933 survey flights to pioneer commercial air routes across the Atlantic. You can be sure that if you visit at noon on any given Wednesday, you will drop in on an interesting talk.

Surrounded by objects that represent technological triumph over challenge, visitors will find it hard not to feel inspired. As Nicole Malachowski said in her lecture, "This place has the ability to change people's lives." Nicole went on to say that when she visited the Museum as a sixth grader with dreams of becoming a fighter pilot (before women could be), she realized that aviation was about courage, confidence, and taking chances to achieve things that others had not done before. Aviation certainly can be inspirational. It's just a whole lot more so when people like Bob Cardin and Nicole Malachowski are here to tell you about it.

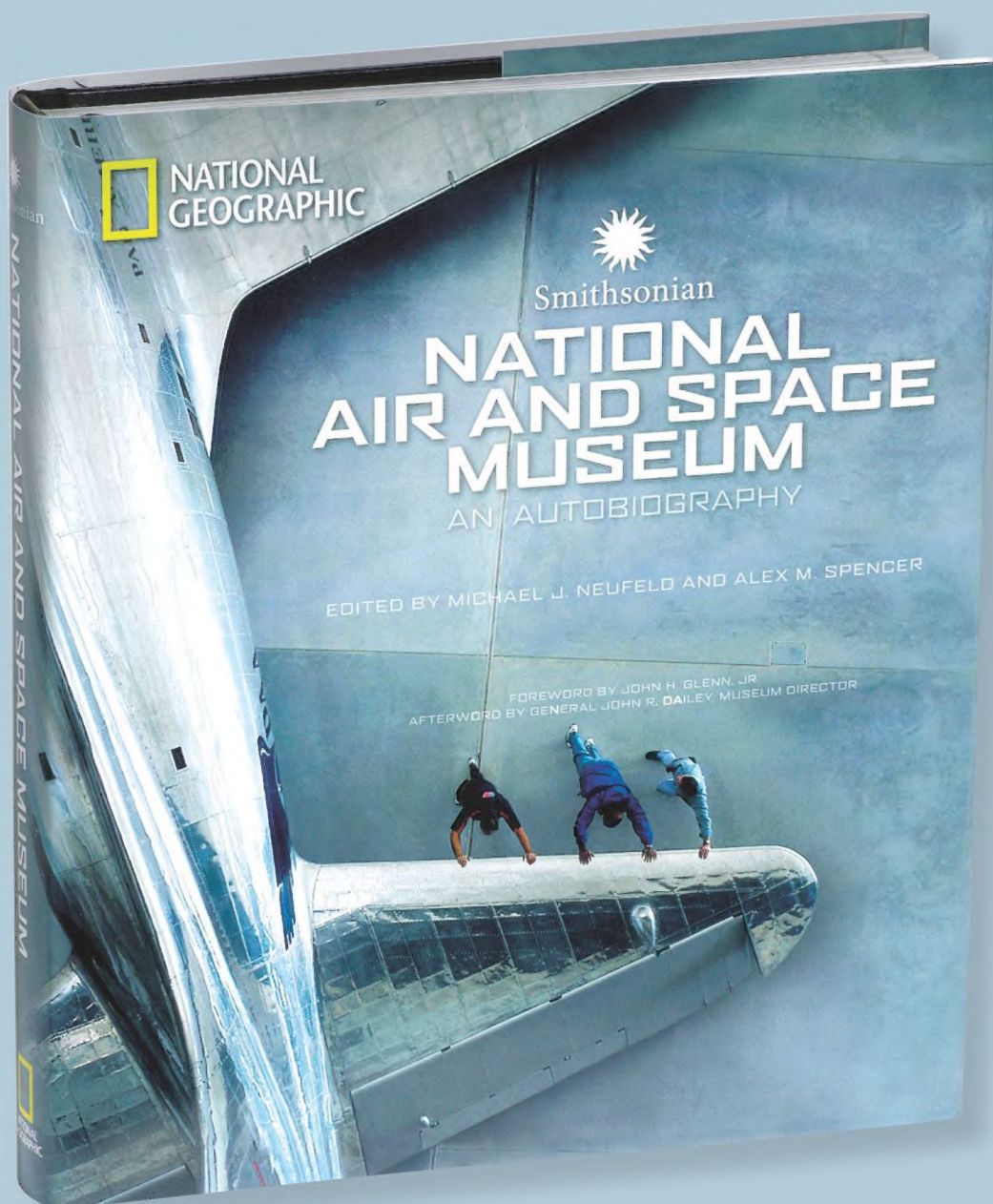
■ ■ ■ J.R. DAILEY IS THE DIRECTOR OF THE NATIONAL AIR AND SPACE MUSEUM.



AN EXCLUSIVE INSIDER'S TOUR OF A NATIONAL TREASURE

Smithsonian National Air and Space Museum: An Autobiography is the first book ever to capture the fascinating story of one of the top museums on Earth.

This richly illustrated 400-page volume takes readers on a captivating tour of this renowned institution, the largest showplace of its kind, dedicated to aviation technology and exploration and the quest to know the universe. With museum curators as your guides, you'll go behind the scenes to explore nearly 20 acres and 150 years of aviation history and innovation, from the Wright Brothers to Hubble, space capsules to moon rocks, and beyond.



- 700 photographs include iconic shots and some never before seen
- Collections through the decades—posters, airplanes, spacesuits, and more
- Record makers and breakers
- Military history and aircraft
- Legendary voices and backroom stories
- Rare treasures never viewed by the public



*A stunning keepsake of a world-class museum
and a wonderful tribute to the
achievements and legends of aviation.*



AVAILABLE WHEREVER BOOKS ARE SOLD
nationalgeographic.com/books

Letters

WRITE TO US

A Peacemaker's Violent End

"Monster Bomber" (Aug. 2010) brought to mind an RB-36 (the recon version of the B-36) that crashed near Burgoyne's Cove in eastern Newfoundland. The aircraft went down in appalling weather and far off course on March 18, 1953, killing all 23 on board.

The debris is still at the site, and pretty much as it was, since it is fairly protected: One has to climb 600 feet up a dry riverbed to reach it. I have taken a number of photographs (example below).

Richard Stoker
St. John's, Newfoundland, Canada

Don't Ask How It Works

My pilot superstition ("One More for the Checklist," Sept. 2010) is a Buddha medallion; it worked pretty well

through my three tours in Vietnam as an F-4 pilot.

Those who don't believe in such things should keep in mind a (probably apocryphal) story about the famous physicist Niels Bohr. Dr. Bohr had a horseshoe hanging over his door. One of his fellow physicists, noticing it, said, "Niels, you don't really believe in that superstition, do you?"

"Of course not," Dr. Bohr replied. "But I understand it works even if you don't believe in it."

Jonathan A. Hayes
Corvallis, Oregon

The WASPs Descend

In 1944, I was 12 years old and fascinated by anything to do with aviation. One Sunday, as we were sitting down for dinner at my uncle's farm, I looked through the dining room window and saw an airplane land in a field nearby. I dashed outside to get a better look and was delighted to see two more aircraft approaching. They must have been either Stinson L-5 Sentinels or Taylorcraft L-2M Grasshoppers. The aircraft were piloted by WASPs ("Flying Bombers in World War II," Aug. 2010) and had apparently been blown off course. Running low on fuel, the pilots landed where they could.

The flight leader came to the house and called her base, requesting a fuel truck as soon as possible. Memories are a little hazy now, but I think the flight leader dined with us, while the other pilots stayed with the aircraft. It seemed like so much fun that I couldn't understand why she seemed so concerned. Years



COURTESY RICHARD STOKER

RB-36 no. 51-13721 crashed while flying from Portugal's Azores islands to Rapid City, South Dakota.



Smithsonian Enterprises

MEDIA GROUP

Director, Smithsonian Media	Thomas Ott
Executive Asst. to the President	James A. Babcock
General Manager	Alan Chu
Assoc. Publisher, Marketing & Sales Development	Rosie Walker

ADVERTISING	(212) 916-1300
Ad. Services Manager New York	Marilyn Cruz James F. Else, Regional Sales Dir., Rob Birkhead, Meryle Lowenthal, Elise I. Boeger
Midwest	Bill Milligan
Detroit	Colleen Maiorana
Southwest	Steve Moynihan
Southeast	Kelly Hediger
West Coast	Kate Knox, Charles Carroll
Caribbean/Cent. Amer.	Al Nadal
Mexico	Elsie Mendez Enriquez
Canada	Richard Brown, David Seaberg, Greg M. Smith
Japan	Yoshinori Ikeda, Shigenori Nagatomo
Thailand	Yvan Van Outrive, Ja Pipatra
Korea	S.S. Song
Direct Response	MI Media Services, LLC

MARKETING/RESEARCH

Associate Art Director	Natalie Thompson
Associate Marketing Dir.	Laurie A. Corson
Marketing Manager	Caitlin McCarthy
Promotions Coordinator	Elizbaeth Stoll
Research Manager	Marilyn Resciniti

CONSUMER MARKETING

Consumer Marketing Dir.	Lisa Dunham
Planning Director	Elizabeth Uzielli
Fulfillment Director	Andrea Sole
Renewals & Gift Dir.	Susan Warner
Purchasing & Operations Manager	Grace Riker
New Business Director	Lori Paldino
Gift Manager	Jonathan Balangon
Associate New Business Manager	Laura E. Vichick
Renewals Marketing Coordinator	Stephanie Petta

ONLINE PUBLISHING GROUP

Director, Internet Business Operations and Strategy	Michelle McMahon
Manager, Online Marketing and Analysis	Jennifer L. Bock
Sr. Web Designer	Bilikya Schiller
Web Developers	Damie B. Malone, Tony Rosenberger
Sr. Web Producer	Kelly Durkin
Producer	Cheryl Carlin

MANUFACTURING

Director	Sarah D. Kingsley
Prepress Director	Katherine Balch
Prepress Manager	Frank Matthew Hale II
Prepress Manager	Marie Koller
Color and Quality Mgr.	Stanley Boone
Adv. Systems Manager	Penie Atherton-Hunt

BUSINESS OFFICE

Business Manager	Ed Dequina
Accountant	Joanne Hubbard

SMITHSONIAN ENTERPRISES

President	Thomas Ott
------------------	------------



© photobank.kiev.ua/Shutterstock.

Master the Art of Critical Decision Making

Making wise, educated decisions is essential to a successful life. But good decisions are not chance acts. Rather, making a wise decision is a skill—one that can be learned, honed, and perfected. Discover how to approach the critical decisions in your professional and personal life using a more seasoned, educated eye with **The Art of Critical Decision Making**. This fascinating course reveals how individuals, groups, and organizations make effective decisions, and offers you tips and techniques to enhance the effectiveness of your own decision making.

In these 24 lectures, award-winning Professor Michael A. Roberto—a scholar of managerial decision making and business strategy—employs the case method used by America's most prestigious business schools to expose you to a wealth of real-world scenarios that demonstrate how critical decisions are made. An engaging and practical guide to one of the most fundamental activities of everyday life, **The Art of Critical Decision Making** will teach you how to learn from your mistakes, effectively weigh your options, and make smarter decisions.

This course is one of The Great Courses®, a noncredit, recorded college lecture series from The Teaching Company®. Award-winning professors of a wide array of subjects in the sciences and the liberal arts have made more than 300 college-level courses that are available now on our website.

The Art of Critical Decision Making

Taught by Professor Michael A. Roberto,
Bryant University

Lecture Titles

- | | |
|-----------------------------------------|-----------------------------------------------|
| 1. Making High-Stakes Decisions | 13. Creativity and Brainstorming |
| 2. Cognitive Biases | 14. The Curious Inability to Decide |
| 3. Avoiding Decision-Making Traps | 15. Procedural Justice |
| 4. Framing—Risk or Opportunity? | 16. Achieving Closure through Small Wins |
| 5. Intuition—Recognizing Patterns | 17. Normal Accident Theory |
| 6. Reasoning by Analogy | 18. Normalizing Deviance |
| 7. Making Sense of Ambiguous Situations | 19. Allison's Model—Three Lenses |
| 8. The Wisdom of Crowds? | 20. Practical Drift |
| 9. Groupthink—Thinking or Conforming? | 21. Ambiguous Threats and the Recovery Window |
| 10. Deciding How to Decide | 22. Connecting the Dots |
| 11. Stimulating Conflict and Debate | 23. Seeking Out Problems |
| 12. Keeping Conflict Constructive | 24. Asking the Right Questions |

Order Today!

Offer Expires Tuesday, December 7, 2010

The Art of Critical Decision Making
Course No. 5932
24 lectures (30 minutes/lecture)

DVDs ~~\$254.95~~ **NOW \$69.95**

+ \$10 Shipping, Processing, and Lifetime Satisfaction Guarantee

Audio CDs ~~\$179.95~~ **NOW \$49.95**

+ \$10 Shipping, Processing, and Lifetime Satisfaction Guarantee

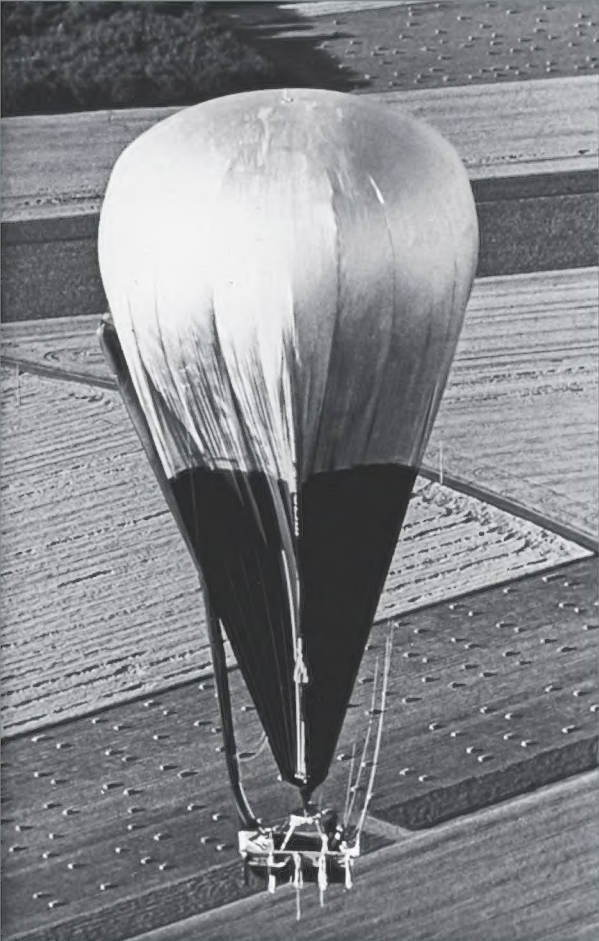
Priority Code: 40293



THE TEACHING COMPANY®
The Joy of Lifelong Learning Every Day™
GREAT PROFESSORS, GREAT COURSES, GREAT VALUE
GUARANTEED.™

1-800-TEACH-12
www.TEACH12.com/3sas

ACT NOW!



NASM (SI NEG. #7A43915-P)

VISIT THE *AIR & SPACE* Web site to see images from the Smithsonian’s National Air and Space Museum, which boasts one of the world’s top photography collections. In our slideshow “*The Legacy of Flight*,” watch Otto Lillienthal gliding down hillsides near Berlin in the 1890s, observe a 1915 battleground from above in an early aerial reconnaissance photograph, and witness wingwalker Gladys Ingle making a midair transfer.

Also, check out our guide to *scale-model solar systems* located in parks and outdoor spaces around the country from California to Washington, D.C.

In the last issue, you read about pilot Gertrude Tompkins Silver, the only WASP missing from World War II (“Cold Case”). Now watch a video that chronicles the recent search for her.

From “*Legacy of Flight*”: In August 1978, three aeronauts became the first to cross the Atlantic by balloon.

Letters

later, as a naval aviator, I could understand why calling your base to say you were in a farmer’s field out of fuel instead of at your destination could be a cause for concern.

The adventure ended when a fuel truck arrived. All aircraft got airborne and disappeared in the afternoon sky. I wonder if the pilots enjoyed telling the story as much as I did watching the day’s events unfold.

Capt. David B. Fickenscher
U.S. Navy (ret.)
Williamsburg, Virginia

Cessnas Don’t Time-Travel

The Cessna L-19 did not exist in 1948 (“Cornwell’s Folly,” *Above & Beyond*, Aug. 2010). That design made its first flight in 1949, and was delivered to the military in 1950.

Mike Keville
Tucson, Arizona

The History of Aerospace, Viewed from Nebraska

Our family farm is about 10 miles south of Ewing, Nebraska, and I spent every summer from age 8 to 18 there. I remember my grandfather, John Bauer, talking about the Savidge brothers (In the Museum, Aug. 2010). He was born in 1905 and remembers riding into town on Sundays in the horse and buggy to go to church. On their way home in the afternoon, they would see the brothers flying in the distance. It must have been quite a sight for a 10-year-old.

Fast forward to July 20, 1969. I remember sitting at the kitchen table that day with Grandpa and Grandma, along with my brother, watching Neil Armstrong walk on the moon. It didn’t hit me then, but years later, I thought about how amazing it must have been for my Grandpa to have seen the Savidges fly when he was 10 and then to see the first man on the moon at age 63.

Dan Donohoe
via airspacemag.com



Secretary	G. Wayne Clough
Director, National Air and Space Museum	General John R. Dailey, USMC (ret.)
SMITHSONIAN BOARD OF REGENTS	
Chancellor	John Roberts, Chief Justice of the United States
Chair	Patricia Q. Stonesifer
Vice Chair	Alan G. Spoon
Members	
Joseph R. Biden Jr. Vice President of the United States	
<i>Appointed by the President of the Senate</i>	
Hon. Thad Cochran Hon. Christopher J. Dodd Hon. Patrick J. Leahy	
<i>Appointed by the Speaker of the House</i>	
Hon. Xavier Becerra Hon. Sam Johnson Hon. Doris Matsui	
<i>Appointed by Joint Resolution of Congress</i>	
Dr. France Córdova Dr. Phillip Frost Dr. Shirley Ann Jackson Mr. Robert P. Kogod Mr. John W. McCarter Jr. Mr. David M. Rubinstein Mr. Roger W. Sant	
SMITHSONIAN NATIONAL BOARD	
Chair	Mr. Paul Neely
Vice Chairs	Mrs. Peggy Paulson Burnet Ms. Judy S. Huret Mr. Gary B. Moore
National Board	
Mr. Rodney C. Adkins Mr. Gordon M. Ambach Ms. Valerie Anders Mrs. Judy Hart Angelo Hon. Barbara McConnell Barrett Mr. William H. Bohnett Ms. Jane Lipton Cafritz Mr. Thomas H. Castro Mr. Wilmer S. Cody Ms. Abby Joseph Cohen Mr. James F. Dicke II Mr. John G.B. Ellison Jr. Ms. Sakurako D. Fisher Mr. Michael R. Francis Mr. John French III Mrs. Shelby M. Gans Mr. E.K. Gaylord II	Ms. Myra M. Hart Mr. Richard W. Herbst Mr. Robert F. Higgins Mr. Steven G. Hoch Mr. Jonathan M. Kemper Mrs. Betsy Lawer Mr. Robert E. Long Jr. Mr. Robert D. MacDonald Mrs. Dorothy S. McAuliffe Mr. Chris E. McNeil Jr. Mr. Russell E. Palmer Jr. Mr. William M. Ragland Jr. Mrs. Kristin Richardson Hon. Ronald A. Rosenfeld Mrs. Marna Schnabel Mrs. Phyllis M. Taylor Mr. Douglas C. Walker Mrs. Wendy Somerville Wall (ex-officio)
Honorary Members	
Mr. Robert McC. Adams Mr. William S. Anderson Hon. Max N. Berry Mr. L. Hardwick Caldwell III Mr. Frank A. Daniels Jr. Mr. Charles D. Dickey Jr. Mrs. Patricia Frost Mr. I. Michael Heyman	Mr. James M. Kemper Jr. Mrs. Jean B. Mahoney Justice Sandra D. O'Connor (ret.) Mr. Francis C. Rooney Jr. Mr. Wilbur L. Ross Jr. Mr. Lloyd G. Schermer Hon. Frank A. Weil Mrs. Gay F. Wray

ADVERTISEMENT



Millions are scrambling for the 2010 Silver Eagle...But we're giving it away TODAY at our cost!

The economic crisis has sparked a huge demand for U.S. Mint Silver Eagles. Collectors, investors, dealers and the public alike are scouring the country to obtain them, creating a serious national shortage. But today, as a special offer to new customers you can own these HEFTY Silver Dollars at our cost—only \$23.93!*

You Cannot Buy This Coin From the Mint!

The U.S. Mint does not sell Silver Eagle Dollars direct to the public. You can only obtain them through an authorized distributor. We have just reserved a fresh shipment of 2010 U.S. Mint Silver Eagles—the current U.S. Silver Dollar. These massive and attractive coins contain one full troy ounce of silver and feature the historic image of Miss Liberty draped in a U.S. flag walking boldly into the future.

No, We're Not Crazy!

Why are we giving away this silver dollar at our cost? Because we want to introduce you to what hundreds of thousands of our satisfied customers have discovered since 1984—we're your **best source for coins worldwide**. That's why we're giving away this 2010 U.S. Silver Eagle to you—for just \$23.93**—to put you on the ground floor of great values like this—values our customers enjoy every day.

Highest Demand Ever for 2009 Eagles. Act Before The 2010s Disappear!

We've never experienced such demand for Silver Eagles as we did in 2009. We predict the same for the 2010 Silver Eagles. So please hurry! They're available RIGHT NOW. And with the current financial crisis they could easily sell out.

Don't Miss Out! Limit 3 Per Customer

At our cost, we must set a strict limit of 3 coins per customer. The allure of silver is timeless, and the precious metal is a proven hedge against economic uncertainty. Don't miss out! Call immediately, toll free, 1-888-373-0655 to add these elusive Silver Eagles to your holdings!

TOLL-FREE 24 HOURS A DAY
1-888-373-0655

Offer Code SET171

Please mention this code when you call.

 **GovMint.COM**
YOUR ONE BEST SOURCE FOR COINS WORLDWIDE

14101 Southcross Drive W., Dept. SET171
Burnsville, Minnesota 55337

www.GovMint.com/silvereagle

*Plus a nominal shipping and handling charge

Note: GovMint.com. is a private distributor of government and private coin and medallic issues and is not affiliated with the United States Government. Prices and availability subject to change without notice. ©GovMint.com, 2010

**Price based on spot market silver price of \$18.43.



VOYAGE TO THE EDGE
OF HUMAN INGENUITY



978-0-8130-3518-5 | HARDCOVER \$24.95

"From the *Mariner* probes of the 1960s to the rovers '*Spirit*' and '*Opportunity*,' from fanciful human travel in science fiction to realities for human exploration in the future, this book places into context the lure of the red planet and our desire to know it better."—Roger Launius, Senior Curator, National Air and Space Museum, Smithsonian Institution

THEY RISKED THEIR LIVES
TO SAVE OTHERS



978-0-8130-3490-4 | HARDCOVER \$24.95

"The true story of *Brothers to the Rescue* finally told in a compelling, riveting narrative that brings the reader inside the founding, growth, and tragic end of one of Florida's most important Cuban exile organizations."—Victor A. Triay, author of *Fleeing Castro*



UNIVERSITY PRESS OF FLORIDA
800.226.3822 | WWW.UPF.COM

GAINESVILLE TALLAHASSEE TAMPA BOCA RATON PENSACOLA
ORLANDO MIAMI JACKSONVILLE FORT MYERS SARASOTA

Letters

Balloonists on the Fringe

"The Drifters" (Aug. 2010) reminded me of an article I read in the 1930s, about a sport called balloon hedge hopping, popular in England. Participants filled large single-envelope balloons with just enough gas to provide a little lift, then launched themselves with a jump. The altitude reached was related to the force of the kickoff, usually just 50 to 100 feet.

Bill Harker
Temecula, California

In 1974, I was a U.S. Air Force operations officer at Lajes Field in the Azores, Portugal. We had been alerted that Thomas Gatch, attempting to cross the Atlantic by cluster balloon, might be headed our way. The official stance of the U.S. Air Force was that it would mount no search-and-rescue missions if he was lost. The rescue squadron once based in the Azores had been decommissioned a year earlier. After it was announced that Mr. Gatch was missing, I remember taking multiple telephone calls from a Spanish TV station wanting to send a reporter to the island to ride with the search aircraft. They refused to believe that the Air Force was not out searching for the balloonist.

The U.S. Navy had a squadron of P-3 patrol aircraft there, but officially they weren't flying rescue missions either. It was rumored that some of the P-3 pilots were ending their patrols near the search area and flying unofficial searches. Mr. Gatch's being the son of an admiral had some benefits. Unfortunately, we never heard or saw anything of the balloonist.

William Brost
Essex Fells, New Jersey

A Newfoundland Goof

The review of *Yesterday We Were in America* (Reviews & Previews, Aug. 2010) describes John Alcock and Arthur Brown starting their record-setting transatlantic flight from "Newfoundland, Canada." In 1919, Newfoundland was not part of Canada, but rather a self-governing British dominion. It joined Canada in 1949.

Ian Taylor
Stratford, Ontario, Canada

Coffey Time

"The Other Harlem" (Feb./Mar. 2010) struck a very personal note. I still remember making quite a few one-and-a-half-turn spins over Harlem Avenue. (I could have been the one pulling through the Cub's propeller in the photograph on page 55.) My old log confirms that in 1940, Cornelius Coffey was my instructor. I remember one day while Coffey and I were flying, he told me he had engine failure (I did not notice that he had pulled back the throttle). He told me to find a landing spot. I did, and within a few feet of setting down, he shoved the gas forward. We both laughed.

No doubt Coffey is long gone.
I am 91!

Ray Gieser
Crossville, Tennessee

Correction

Aug. 2010 "Flying Bombers in World War II": Fairfax Field is in Kansas City, Kansas, not Missouri.

WRITE TO US at Letters, *Air & Space/Smithsonian*, MRC 513, P.O. Box 37012, Washington, DC 20013. Please type or print clearly. You must include your full address and daytime phone number.

e-mail: editors@si.edu. All e-mails must include your full name, mailing address, and daytime phone number.

Air & Space is not responsible for the return of unsolicited materials. Never send unsolicited original photographs to the Letters department; send only copies.

All letters selected for publication are edited. We reserve the right to publish letters in the magazine, on our Web site (airspacemag.com), or both. We regret that we cannot respond to every letter.

NATIONAL AIR AND SPACE SOCIETY
2010 Vice Admiral Donald D. Engen
Flight Jacket Night

Featuring pilot, author, and artist
Richard C. Kirkland

Friday, November 12, 2010 • 8:00 p.m.
National Air and Space Museum

Flight jacket optional

Richard C. Kirkland flew 103 combat missions in P-38 and P-47 fighters with the famed "Flying Knight" squadron in the South West Pacific during WWII. He flew one mission with Charles A. Lindbergh who was teaching fuel economy during the war. After WWII, Richard participated in the atomic bomb test "Operation Greenhouse." During the Korean War he flew 69 helicopter missions rescuing downed airmen from behind enemy lines and evacuating wounded to the 8055 MASH. After his military career he was a demonstration pilot for Hughes Aircraft and was subsequently in management there. He documented his amazing experiences in sketches and paintings and after retirement recorded them in magazine articles and five published books. Richard C. Kirkland is a true aviation pioneer.

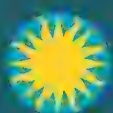
The lecture is for members of the Museum's National Air and Space Society. There is no charge to attend, but advance reservations are required. Visit www.nasm.si.edu/membertickets to reserve a space. Seating is limited.

Not a member of the National Air and Space Society?

Membership in the Society directly supports the mission and programs of the National Air and Space Museum and includes a subscription to *Air & Space* magazine. Membership levels begin at just \$35. Visit www.nasm.si.edu/membership to join or upgrade today.

There will also be a buffet reception before the lecture with Mr. Kirkland for Society members at the Mercury *Friendship 7* level and higher.

**For more information, call 202.633.2603
or email nasmmembership@si.edu.**



Smithsonian
National Air and Space Museum

Independence Avenue at Sixth Street SW, MRC 321 PO Box 37012, Washington DC 20013-7012

Holding Pattern

ON A CLEAR DAY, while approaching Calgary International Airport from the south, you'll see in a farmer's field what looks like a dozen derelict World War II Avro Anson trainers arranged in a huge circle. "They're a metaphor for life," says University of Alberta art professor Keith Harder. "They say a lot about death and dying, about gravity." His art installation, "Gravitas," is visible only from above and is inaccessible to the public.

Harder says the circle is like a compass rose, a reference to flying—or like a clock, a reference to time. It's part of his series "The Children of Icarus," which is composed of imagery involving sky and flight.

Ansons were the standard twin-engine trainers of the wartime British Commonwealth Air Training Plan, which had dozens of stations near the site of Harder's installation. At its peak, it boasted 94 schools, 231 sites across



Canada, and 10,840 airplanes; it graduated 3,000 aircrew each month.

"Just about every farmer here bought an Anson after the war for maybe 50 bucks just for the wiring and

hydraulics," says Bob Evans, curator of nearby Nanton's Bomber Command Museum, which allowed Harder to use the carcasses and scraps. A few decades ago, the museum had

Avro Anson remnants circle the wagons in the art installation "Gravitas" in Calgary, Alberta, Canada.

undertaken what it called Operation Annie—a retrieval of numerous Ansons. "We wanted to store these someplace anyway," says Evans. "If there happens to be a fitting or part of an engine, we are still free to take them." The artist was offered some pasture land by Charles Logie, who runs an aviation firm.

Choosing a grassy knoll, Harder covered his circle with gravel except for 12

UPDATE

The Air Force, 20 Years Hence

AFTER A YEAR-LONG STUDY, the U.S. Air Force Chief Scientist has come out with a new Technology Horizons report, a roadmap for navigating the future technological landscape ("How To Win Enemies and Influence Policy," Aug. 2010). "By 2030 machine capabilities will have increased to the point that humans will have become the weakest component in a wide array of systems and processes," the report says, and notes possible developments in brainwave-controlled machines, hyper-precise bombs, and atomic clocks that fit on a computer chip. "Closer human-machine coupling and augmentation of human performance will become...essential."

**Limited
Availability**

Less Than
~~400~~ 290
Ounces
of Tanzanite
Remain in
This Special
Purchase.

*2 carats of
Genuine
Tanzanite
Save \$700!*

African Gem Cutter Makes \$2,689,000 Mistake...Will You?

This story breaks my heart every time. Allegedly, just two years after the discovery of tanzanite in 1967, a Maasai tribesman knocked on the door of a gem cutter's office in Nairobi. The Maasai had brought along an enormous chunk of tanzanite and he was looking to sell. His asking price? Fifty dollars. But the gem cutter was suspicious and assumed that a stone so large could only be glass. The cutter told the tribesman, no thanks, and sent him on his way. Huge mistake. It turns out that the gem was genuine and would have easily dwarfed the world's largest cut tanzanite at the time. Based on common pricing, that "chunk" could have been worth close to \$3,000,000!

The tanzanite gem cutter missed his chance to hit the jeweler's jackpot...and make history. Would you have made the same mistake then? Will you make it today?

In the decades since its discovery, tanzanite has become one of the world's most coveted gemstones. Found in only one remote place on Earth (in Tanzania's Merelani Hills, in the shadow of Mount Kilimanjaro), the precious purple stone is 1,000 times rarer than diamonds. Luxury retailers have been quick to sound the alarm, warning that supplies of tanzanite will not last forever. And in this case, they're right. Once the last purple gem is pulled from the Earth, that's it. No more tanzanite. Most believe that we only have a few years supply left, which is why it's so amazing for us to offer this incredible price break. Some retailers along Fifth Avenue are more than happy to charge you outrageous prices for this rarity. Not Stauer. Staying true to our contrarian nature, we've decided to *lower the price of one of the world's rarest and most popular gemstones.*

Our 2-Carat *Sunburst Tanzanite Ring* features marquise-cut gems set dramatically in gorgeous sterling silver. Each facet sparkles with the distinct violet-blue hue of the precious stones. Behind the shine you'll find that the exquisite silverwork of the setting calls to mind the detailed treasures being produced by Europe's finest jewelers. This is a ring designed to impress and it does not disappoint.

Now is the point where opportunity knocks. If you open that door today, you can own this spectacular ring for less than \$100. If you wait? We can't say for sure.

Your satisfaction is completely guaranteed. For our client-friendly approach, Stauer has earned a rare **A+ rating from the Better Business Bureau**, a rating we wish to keep. So, of course, your satisfaction is 100% guaranteed. If you are not completely aglow with the *Sunburst Tanzanite Ring*, send it back within 30 days for a prompt and courteous refund. But, please don't wait, our supply is dropping rapidly.

JEWELRY SPECS:

– 2 ctw genuine tanzanite – .925 sterling silver setting – Ring sizes 5–10

**Sunburst Genuine Tanzanite Ring (2 ctw)—~~\$795~~
Now \$95 +S&P Save \$700**

Call now to take advantage of this limited offer.

1-888-201-7112

Promotional Code TZR139-01

Please mention this code when you call.



ACCREDITED
BUSINESS

**Stauer has a Better Business
Bureau Rating of A+**

Stauer

14101 Southcross Drive W., Dept. TZR139-01
Burnsville, Minnesota 55337

stauer.com

Anson-size silhouettes, in which he allows vegetation to grow and where he precisely placed the aircraft remains. Harder says the installation will become a lasting symbol of World War II pilot training on the prairies in the same way local ancient stone medicine rings have endured.

GRAHAM CHANDLER

From Prowlers to Growlers

LAST JUNE, the U.S. Navy's oldest EA-6B Prowler made its final flight, from Naval Air Station Patuxent River in Maryland to its retirement home at Naval Air Station Pensacola in Florida.

The test pilots and aircrew of Air Test and Evaluation Squadron 23 (VX-23) at Pax River had used side-number 534 (Navy serial number 156481) for more than a

decade as a platform for testing the latest EA-6B components, systems, and capabilities. Its final

WORK IN PROGRESS

Around the World in...Many, Many Days

IN 2003, cancer patient Norman Surplus saw an autogyro being restored and vowed that when he recovered, he would learn to fly one. Late last March, Surplus departed from his hometown in Northern Ireland in an Autogyro GMBH MT-03 on a 27,000-mile round-the-world flight. The journey, at 85 mph and 1,200 feet, was expected to take four months, but Surplus spent three months in Thailand after ditching in a lake. Follow his progress (and contribute to his charity, Bowel Cancer UK) at gyroxgoesglobal.com.



Norman Surplus, pictured here over Nong Prue, Thailand, wants to set an Absolute World Record with the Fédération Aéronautique Internationale: the first to fly around the world in an autogyro.

assignment: serve as a static display at the National Naval Aviation Museum in Pensacola.

P-4 number 156481 was the fourth of five developmental Prowlers. Airframes P-1 through P-3 began their lives at Grumman as A-6 Intruders, but after production began were diverted to the EA-6B line. P-4 was the first aircraft actually built from start to finish as a Prowler. It was accepted on December 31, 1969. Of the five originals, P-4 is the only one still flying more than 40 years later.

Though P-4 has been the

oldest of the active EA-6Bs, it did not boast the flight statistics typical of fleet aircraft. It logged 924 carrier-arrested landings, compared with 2,441 traps made by the operating forces' trap leader as of June. And with only 6,186 flight hours, it flew only half as much as the leader in that category, with 12,074 hours.

The Navy is transitioning from the EA-6B Prowler to the EA-18G Growler, a modified version of the two-seat F/A-18F Super Hornet; the last squadron transition is due around 2014. The Marine Corps will continue using the latest variant of the EA-6B in its four electronic attack squadrons until 2019. (Watch for a profile of the Growler in a forthcoming issue of *Air & Space*.)

LIEUTENANT COMMANDER DONALD COSTELLO



Left, top: The VX-23 EA-6B Test Team at Patuxent River Naval Air Station, June 2010, just before serial no. 156481 retired, and (left) the original EA-6B test team in 1970 at Pax River with the brand-new Grumman.

No
Contract

Finally, a cell phone that's... a phone!

Price
Reduced by
\$48

"Well, I finally did it. I finally decided to enter the digital age and get a cell phone. My kids have been bugging me, my book group made fun of me, and the last straw was when my car broke down, and I was stuck by the highway for an hour before someone stopped to help. But when I went to the cell phone store, I almost changed my mind. The phones are so small I can't see the numbers, much less push the right one. They all have cameras, computers and a "global-positioning" something or other that's supposed to spot me from space. Goodness, all I want to do is to be able to talk to my grandkids! The people at the store weren't much help. They couldn't understand why someone wouldn't want a phone the size of a postage stamp. And the rate plans! They were complicated, confusing, and expensive... and the contract lasted for two years! I'd almost given up when a friend told me about her new Jitterbug phone. Now, I have the convenience and safety of being able to stay in touch... with a phone I can actually use."

Questions about Jitterbug?

Try our pre-recorded Toll-Free Hotline 1-877-778-0756.

The cell phone that's right for me. Sometimes I think the people who designed this phone and the rate plans had me in mind. The phone fits easily in my pocket, but it flips open and reaches from my mouth to my ear. The display is large and backlit, so I can actually see who is calling. With a push of a button I can amplify the volume, and if I don't know a number, I can simply push one for a friendly, helpful operator that will look it up and even dial it for me. The Jitterbug also reduces background noise, making the sound loud and clear. There's even a dial tone, so I know the phone is ready to use.

Affordable plans that I can understand – and no contract to sign! Unlike other cell phones, Jitterbug has plans that make sense. Why should I pay for minutes I'm never going to use? And if I do talk more than I plan, I won't find myself with no minutes like my friend who has a prepaid phone. Best of all, there is no contract to sign – so I'm not locked in for years at a time or subject to termination fees. The U.S. – based customer service is second to none, and the phone gets service virtually anywhere in the country.

Monthly Minutes	50	100	200
Monthly Rate	\$14.99	\$19.99	\$29.99
Operator Assistance	24/7	24/7	24/7
911 Access	FREE	FREE	FREE
Long Distance Calls	No add'l charge	No add'l charge	No add'l charge
Voice Dial	FREE	FREE	FREE
Nationwide Coverage	YES	YES	YES
Trial Period	30 days	30 days	30 days

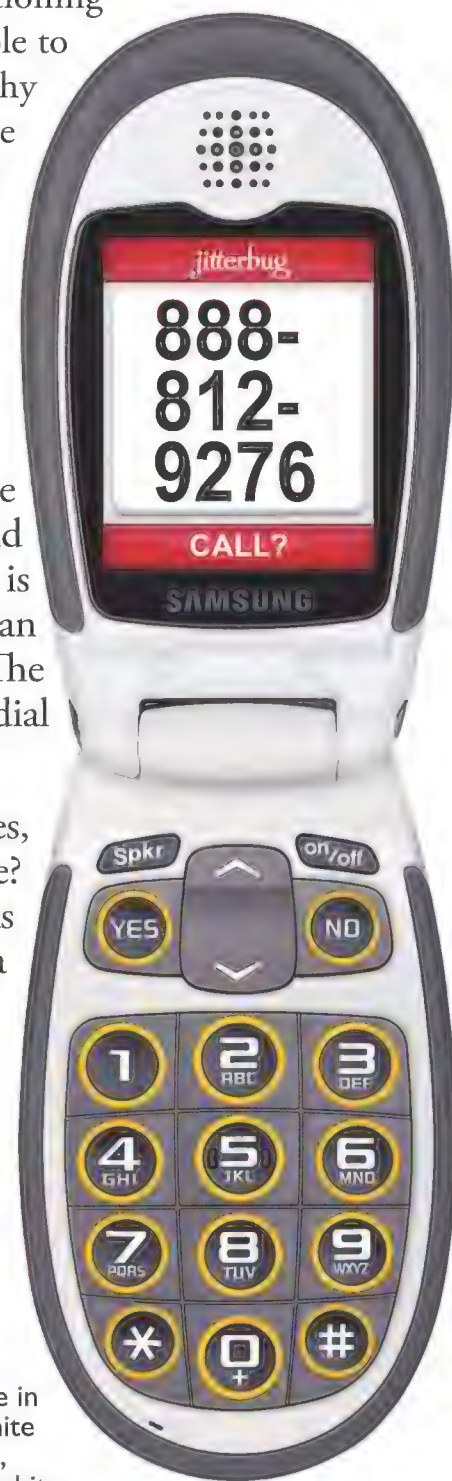
More minute plans available. Ask your Jitterbug expert for details.

FREE Gift

Order now
and receive a
free Car Charger.
A \$24 value!



Available in
Red, White
(shown),
and Graphite.



Call now and get a FREE GIFT. Try Jitterbug for 30 days and if you don't love it, just return it. Why wait, the Jitterbug comes ready to use right out of the box. The phone comes preprogrammed with your favorite numbers, and if you aren't as happy with it as I am you can return it for a refund of the purchase price. Call now, the Jitterbug product experts are ready to answer your questions.

jitterbug®



firstSTREET®
for Boomers and Beyond®
1998 Ruffin Mill Road
Colonial Heights, VA 23834

Jitterbug Cell Phone

Call now for our NEW low price.
Please mention promotional code 41200.

1-888-812-9276
www.jitterbugdirect.com

IMPORTANT CONSUMER INFORMATION: All rate plans require the purchase of a Jitterbug phone and a one-time set up fee of \$35.00. Coverage and service is not available everywhere. There are no additional fees to call Jitterbug's 24-hour U.S. Based Customer Service. However, for calls to an Operator in which a service is completed, minutes will be deducted from your monthly balance equal to the length of the call and any call connected by the Operator, plus an additional 5 minutes. Rate plans do not include government taxes or assessment surcharges. Prices and fees are subject to change. Savings are based on marketing materials from nationally available cellular companies as of June, 2010 (not including family share plans). The full price of the Jitterbug Phone will be refunded if it is returned within 30 days of purchase, in like-new condition, and with less than 30 minutes of usage. A Jitterbug Phone purchased from a retail location is subject to the return policy of that retail location. The Jitterbug phone is created together with worldwide leader Samsung. Jitterbug is a registered trademark of GreatCall, Inc. Samsung is a registered trademark of Samsung Electronics America, Inc. and its related entities. Created together with worldwide leader Samsung. Copyright © 2010 by firstSTREET for Boomers and Beyond, Inc. All rights reserved.

Grounded

COLTON HARRIS-MOORE'S crime spree came to an abrupt end in a boat chase with gunfire. The 19-year-old, caught by the Royal Bahamas Police Force in the Caribbean last July 11, is now a prime suspect in more than 70 thefts, including stealing—and trashing—three aircraft collectively worth approximately \$1.5 million.

Two years earlier, Harris-Moore, in a Washington state halfway house for a series of robberies, escaped and ran amok. Without any formal pilot training, Harris-Moore is believed to have stolen a 2008 Cessna 400 Corvalis TT on July 4, flown it nonstop from Bloomington, Indiana, to Great Abaco Island in the Bahamas, and splashed

the high-performance, single-engine aircraft in a mangrove swamp.

He also is accused of destroying two Cessna Skylanes in separate incidents. In addition to the aircraft he crashed, authorities believe he took a 2009 Cirrus SR22 GTS used by Cirrus as a demonstrator and another SR22 owned by a private pilot. Both aircraft were landed at the same Washington

“Barefoot Bandit” Colton Harris-Moore does the perp walk – shoeless – in the Bahamas.



state airport and were relatively undamaged.

Harris-Moore is a suspect in the attempted theft of at least two more aircraft during a string of hangar break-ins from Washington and Oregon to British Columbia, Idaho, Wyoming, Nebraska, Iowa, and Indiana. He also allegedly stole firearms and cars, and was reportedly carrying a handgun when he was arrested.

By the end of his crime spree, Harris-Moore had become a

folk hero to some, but not to the residents of the quiet San Juan Islands, where he grew up. “There’s a lot of relief throughout the community,” resident Mark Williams told the Associated Press. “I think the man’s luck just wore out.”

TIM WRIGHT

UPDATE

Jet-Wing Man Soaks, Soars

YVES ROSSY, who in May 2008 made his first jet-wing flight, over the Swiss Alps, and four months later flew across the English Channel (“The Department of Never Mind,” Sept. 2009), had to be plucked from the Atlantic by helicopter last November when a jet-wing flight from Morocco to Spain failed. Since then, Rossy has developed a delta jet-wing that enables him to take off from the ground and pop his parachute faster and at lower altitudes, and provides better maneuverability – so much better that in Switzerland last July, Rossy flew in formation with two Stearmans, each carrying a Breitling wingwalker, for six minutes. Rossy hopes to eventually fly in formation with several jet-wing-equipped colleagues.



Yves Rossy, the one-man aerial vehicle, flies formation with Stearmans.

SoCal, Birthplace of U.S. Aerospace

GIANTS ONCE LIVED in Southern California—Douglas, Lockheed, Northrop, North American, Hughes, Ryan, Consolidated Vultee. Led by bold entrepreneurs and staffed with talented designers, engineers, and test pilots, the companies thrived on a symbiotic relationship with subcontractors and suppliers, the region’s educational institutions, and local communities—Burbank, Downey, Hawthorne, Long Beach, Santa Monica, Culver City—that nourished the work force.

A few years ago, Peter Westwick, a physicist turned science historian at the University of Southern California, began to study the history of these companies and communities for a book on the Jet Propulsion Laboratory, *Into the Black: JPL and the American Space Program, 1976–2004*. “I was trying to

Michael Carriker

CHIEF PILOT, BOEING 787 DREAMLINER

SINCE JOINING BOEING IN 1990, Michael Carriker has been chief project pilot for the 737, the 777, and the 787. He was also a U.S. Navy test pilot and instructor, flying the A7-E Corsair II and F/A-18 Hornet, and has logged more than 8,000 hours.

What did you hope to learn when test-flying the 787?

The very first flight, you live in this little tiny room, right in the middle, where you think your predictions are the best. As time goes on, you investigate the different corners, not only of speed, weight, and altitude, but we investigate the corner of system failures.

Does test-flying an airliner differ from test-flying a military aircraft?

Well, there's no ejection seat. We both test for the mission of the airplane. The F-18 has to carry the weapons to the target, whereas we're blissfully not a weapons-carrying platform; we're a passenger-carrying platform. We want to get every pound of cargo – be it passengers or flowers – to altitude, take it to its destination very efficiently, land in all weather, and get passengers to the gate on time with minimal cost.

You were chief project pilot for the Sonic Cruiser, which was cancelled in 2002. Is commercial aviation ready for a near-Mach-1 airliner?

Yes, but it's tough to get around the laws of physics in an airplane that has the capacity [airlines need] and the cost people want to pay. In studies, nobody wanted to go much faster north to south, or east, because you go from

New York to London – that's your overnight. The only time people wanted to go faster was traveling west.

You also fly the 1933 Boeing 247D and a B-17F for Seattle's Museum of Flight.

I marveled at the increase [in engine start procedures]. We went from an airplane that made 1,200 horsepower to these [787] engines, which [can] make 40,000 horsepower. One needs four hands, one has two switches.

Any airplanes you'd like to fly but haven't?

Some Grumman Cats – a Wildcat, a Bearcat, and a Tigercat. I've never flown in one of these world-class acrobatic airplanes – that would be a real hoot. Strapping on an F-22 wouldn't be a bad day either.

Interviewed by Air & Space intern Mary McKillop.
Read the entire interview at airspacemag.com.

find if JPL enjoyed advantages of being in this epicenter of aerospace industry," says Westwick, "I started research on the industry as a whole.

"A lot of our history is not appreciated or is disappearing," Westwick says. The industry had adapted after World War II to the new Space Age, shifting from aircraft to space vehicles and new propulsion and guidance systems, but when the cold war ended, military priorities changed, and companies began to consolidate and move away. In the process, "the documents...get lost or shredded," Westwick says. In addition, "a lot of the people are passing from the scene."

In 2008, Westwick, with the Huntington-USC Institute on California and the West, directed by William Deverall of the University of Southern California and Dan Lewis at the Huntington Library in Pasadena, set out to establish a central archive to save these resources, an effort recently boosted by a grant from the National Science Foundation.

The Southern California Aerospace archive has attracted impressive materials, including personal files from Lockheed's Ben Rich, Willis Hawkins, and Jack Real, and the founder of Litton Industries, Tex Thornton. "We've already got historians waiting to use the stuff," Westwick says. "The hope is that they write the articles that make this history public knowledge, so people understand what aerospace meant to Southern California."

MARSHALL LUMSDEN



In 1942, in an attempt to improve overall performance, Lockheed Vega workers upgraded a B-17E to an XB-38.

In the Museum

STOPS ON A TOUR THROUGH AMERICA'S HANGAR

Dangerous Crossing

WHEN THE TIME COMES for all good Smithsonian curators to list the most important or interesting object acquired during the past year, I will be calling attention to a historic lifeboat. The story begins, or ends, with a tragedy. On July 2, 1912, aeronaut Melvin Vaniman steered the hydrogen-filled *Akron*, the very first airship manufactured by the

have seen this lifeboat admire it very much," he continued, "and say it is non-capsizable and non-sinkable."

The boat is 27 feet long, with a six-foot beam and 3.5-foot depth amidships. The hull is constructed of three layers of mahogany veneer. The mid-section, protected by a canopy, was the cockpit. The fore and aft ends were decked over

lightweight antenna wire, so that if the airship were forced down at sea, the crew could send the antenna aloft and continue broadcasting.

In addition to its basic role as a refuge for the crew should they end up in the water, the lifeboat served as a kitchen, pantry, and smoking lounge. During the 1910 flight, the airship, its five crew members, and a cat named Kiddo remained aloft for 71 1/2 hours, but were forced down near Bermuda with engine problems. All were rescued by a steamer.

Wellman retired from the field, but Melvin Vaniman, his chief engineer, began planning for a transatlantic flight of his own. Frank Seiberling, the head of Goodyear, agreed to manufacture the gas bag for the airship that would be known as the *Akron*, in honor of the company's hometown (not to be

After 98 years in storage, a historic piece of U.S. aeronautica arrived at the Steven F. Udvar-Hazy Center in northern Virginia. The lifeboat was used on two early attempted airship crossings of the Atlantic.



Goodyear Tire & Rubber Company, up and away from his Atlantic City, New Jersey hangar. Dangling beneath the craft as it nosed out toward the ocean was a lifeboat that was already a veteran of one attempt to fly the Atlantic.

The American journalist and adventurer Walter Wellman purchased the sturdy craft in 1910 as he was preparing the airship *America* to attempt the first powered flight across the Atlantic. S.E. Saunders of East Cowes, on the Isle of Wight, built the lifeboat for the Wellman expedition. "That celebrated builder thinks it the finest piece of work he has ever turned out," Wellman remarked. "Sailors who



to create watertight compartments. One compartment contained the Marconi set, used on the 1910 *America* flight to send the first wireless message from the air. It came complete with a kite and

confused with the Goodyear-built airship ZRS-4 *Akron* of the 1930s). Vaniman decided to reuse Wellman's lifeboat. After a series of test flights, the five-man crew took off on their Atlantic



Flyby

Dear Pacific Health,

I have been taking Claroxan® for about nine months, and I couldn't be happier with your product. An unnerving event spurred me to use Claroxan and I'd like to share that experience in this letter.

It was midsummer and a perfect day for flying. As any experienced pilot knows, the clearest days are actually the most dangerous days to fly because of the unusually high volume of traffic. I had been training with a new private student and we were going out to do some basic maneuvers to get him ready for his first stage check. Everything was going great. A wonderful takeoff and departure, then a smooth ride out to the practice area.

We got set up about 20 miles to the south of the field and decided to start out with some steep turns. We did our pre-maneuver checklist, then started to initiate a left clearing turn, after which we started to roll back to the right. We couldn't have turned back more than 40 degrees from our initial heading when I saw a Baron

heading right for us. I immediately yelled, "My plane!" and evaded with a diving right turn. Luckily, we came away unscathed.

The episode stuck in my head over the next several days: How did I miss that plane? Then one night, as I was relaxing after dinner, I came across an ad for Claroxan in an aviation magazine. A light bulb went off: Maybe my vision was starting to deteriorate! I thought about it, and there were some hints. I was squinting sometimes when trying to read road signs, and the spin on the ball at my tennis league had become just a little harder to pick up.

After about a month, I could see definite improvements in my vision. My vision was clearer, I could pick up on distant objects more easily and movements in my peripheral vision were easier to detect. That frightening moment a few summers ago lead me to Claroxan, and now I recommend it to all my colleagues and students. Keep up the good work, Pacific Health!

Sincerely,
Bob S.



Claroxan® Advanced

The premier Claroxan formula with extra ingredients for added benefits.



Claroxan® Original

The original formula with lutein and zeaxanthin.



Claroxan® Smoker's Formula

The original, minus beta-carotene.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

CLAROXAN® - LEADER IN VISION IMPROVEMENT

Environmental factors cause damage to the retina and macula, leading to declines in vision that glasses or contacts can't help. If you've experienced blurriness or have difficulty seeing details, you know how valuable sharp vision can be. Recently, new scientific research has been performed on natural vision enhancement. This research suggests that lutein and zeaxanthin may

help maintain your vision and provide added protection against many ocular diseases.

Lutein and zeaxanthin may improve macular pigment density, which research shows has amazing effects on vision. By improving macular pigment density, these carotenoids may improve normal visual acuity, contrast sensitivity, and even glare reduction.

People who count on their vision – people like pilots, hunters, and pro athletes – trust Claroxan for vision enhancement and protection. Claroxan is safe, effective, and affordable. However, people with serious health concerns should consult a doctor before use.



ARTIFACTS

When MTV Colonized Mir

WHEN MTV LAUNCHED on August 1, 1981, its theme song played over a video montage of Apollo 11 moon landing space imagery, including Apollo lunar astronauts on the moon, and ending with a Warhol-esque MTV flag. Three years later, the network introduced its Video Music Awards show; winners received a Moonman trophy, modeled on the well-known photograph of astronaut Buzz Aldrin. In a 1996 publicity stunt, MTV sponsor Pepsi sent a stripped-down Moonman to the Russian space station Mir so it would be on board when host Dennis Miller spoke to the cosmonauts by satellite during the awards show. Unfortunately, the delay in Earth-to-space transmission and the language barrier made for an awkward broadcast. In 2007, an MTV producer arranged for the flown Moonman and a blank statuette (left) to be donated to the Museum; the two will eventually be displayed side by side. Margaret Weitekamp, a curator in the Museum's space history division, is struck by how

During a 1996 award show, the foot-tall Moonman floated between MTV-cap-and-T-shirt-wearing cosmonauts Valery Korzun and Aleksandr Kaleri.

often Aldrin's image – bent arm and all – is reproduced: "This image has taken on a life of its own, culturally. And the Moonman is a classic example of that."

attempt on July 2, 1912. They had barely crossed the coastline when, 500 feet in the air, the 400,000 cubic feet of hydrogen caught fire, destroying the gas bag and sending Vaniman, his brother, and three other crewmen to

their deaths. The lifeboat was salvaged from the shallow coastal waters and shipped back to Goodyear, where it spent the next 98 years in storage at the company's Wingfoot Lake airship facility, outside Akron, Ohio.

Following several months of negotiation, Goodyear has donated this important piece of its aeronautical heritage to the National Air and Space Museum. After a period of cleanup and a conservation assessment, it will be displayed at the Steven F. Udvar-Hazy Center, close to two historic transatlantic aircraft—the gondola of the *Double Eagle II*, which in 1978 carried the first balloonists from the United States to Europe, and the Concorde, which pioneered commercial supersonic travel across the Atlantic.

Finally, it is interesting to note that the lifeboat not only survived the first two attempts to cross the Atlantic with a powered aircraft, but was also the first aeronautical product of what was to become a distinguished firm of aircraft builders. In 1929 the British aeronautical pioneer Alliott Verdon-Roe purchased the Saunders firm and created Saunders-Roe Ltd, one of the world's great producers of flying boats. And it all began with a lifeboat.

[Visitor Information]



Family Day On Saturday, October 23, the Museum will host its annual "Air & Scare," from 2 to 8 p.m., at the Steven F. Udvar-Hazy Center. Join creepy space aliens, mysterious astronauts, and ghostly pilots for safe, indoor trick-or-treating. Young visitors will enjoy story times, face-painting stations, costume parades, and free screenings of movies and cartoons in the IMAX Theater. Admission is free, but parking is \$15.



Public Observatory Project Stop by the Museum's east terrace and visit the National Mall's first observatory. Look through the observatory's telescopes to discover the phases of Venus, spots on the sun (using safe solar filters), craters on the moon, and other wonders of the universe. Hours: Thursday through Sunday, from 10 a.m. to 2 p.m. through November, weather permitting. For more information, visit nasm.si.edu/pop.



What's Up Receive regular updates on Museum events, read about artifacts, get detailed (and behind-the-scenes) exhibition information, and receive calendar listings, all by subscribing to the National Air and Space Museum's free monthly newsletter, *What's Up*. Sign up at nasm.si.edu.

■ ■ ■ TOM D. CROUCH

ADVERTISEMENT

U.S. GOV'T GOLD RELEASE

AMERICA'S GOLD AUTHORITY.

**GOLD TOPS \$1,200 PER OZ. 2010
EXPERTS STILL PREDICT \$5,000 PER OZ.**

WEIGHT AND PURITY FULLY BACKED BY THE U.S. GOV'T
LEGAL TENDER GOLD COINS MINTED BY THE U.S. MINT
LIMITED RELEASE AND AVAILABILITY



2010 U.S. GOLD COINS FINAL RELEASE

The United States Rare Coin and Bullion Reserve Vault Facility today announces the final release of 5,000 U.S. Gov't Issued Gold Coins previously held in The West Point Depository/U.S. Mint. U.S. citizens will be able to buy 2010 Gov't Issued \$5 Gold Coins at an incredible no mark-up price of only \$139.26 each. An amazing price because these U.S. Gov't Issued Gold Coins are completely free of dealer mark-up. That's correct, our cost. This is an incredible opportunity to buy U.S. Gov't Issued Gold Coins at cost. The Gold market in June 2010 hit a new high of over \$1,200 per ounce and is predicted by experts to have the explosive upside potential of reaching up to \$5,000 an ounce. A limit of ten U.S. Gov't Issued Gold Coins per customer will be strictly adhered to. Orders that are not immediately reserved with our order center could be subject to cancellation and your checks returned uncashed. Good luck. Order immediately to avoid disappointment. Coins from other years will be shipped if over-sold. Call Toll-Free 1-888-465-3092.

GOLD MARKET EXPLODES

If you had \$50,000 in the bank and you transferred it into Gold at today's prices, you would now have an opportunity to gain as much as 5 times its value—a quarter of a million dollars. That's because when you convert money to Gold, you haven't spent your money, but have transferred its value from a declining paper currency to a precious metal that is rising in both market and numismatic value. Gold protects your money in today's very volatile market. The collapse of the housing market, major bank failures, continued worldwide volatility and the U.S. debt topping a whopping \$13 trillion are just a few reasons to move paper assets into Gold. Catastrophic debt and floundering economies have proven to be the perfect breeding ground that sends Gold through the roof. With prices reaching as high as \$1,200 per ounce in June 2010, it is crucial that individuals move now because as soon as tomorrow, Gold could start its predicted steep rise to \$5,000 per ounce. Do not miss out on this opportunity.

REASONS TO BUY GOLD NOW

\$50,000 in U.S. Gov't Gold Coins could be worth up to \$250,000 in the future.

Gold has outperformed Nasdaq, Dow, and S&P 500 over the past ten years.

Smart individuals are moving 10-20% of their assets into U.S. Gov't Gold Coins.

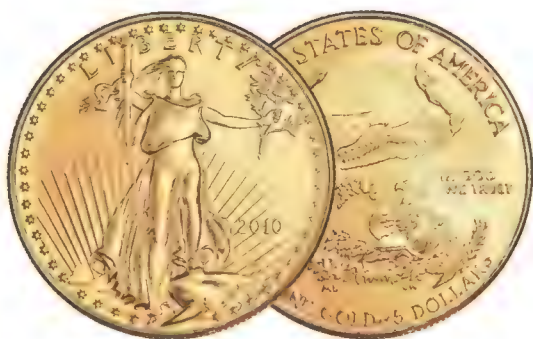
Now may be the best time to take your money out of the bank and put it into U.S. Gov't Gold Coins in your same bank's safe deposit box.

With the National Debt at \$13 trillion and rising, Gold has an upside potential that has not been seen since the 1980's.

Due to very limited supply, offer may be withdrawn at any time.

Good luck. We hope that everyone will have a chance to buy Gold at this current low price.

Special arrangements can be made for Gold orders over \$50,000.



2010 Gold American Eagle

BUY NOW

- 1 - 2010 Gov't Issue Gold Coin \$ 139.26
- 5 - 2010 Gov't Issue Gold Coins \$ 696.30
- 10 - 2010 Gov't Issue Gold Coins \$1,392.60

SPECIAL AT-COST OFFER LIMITED TO PURCHASES
OF 10 COINS (\$1,392.60) PER HOUSEHOLD PLUS
SHIPPING AND INSURANCE.

VAULT CODE: ASM5-13926

**CALL TOLL FREE
1-888-465-3092**

MASTERCARD • VISA • AMEX • DISCOVER • CHECK

BEGINNING TODAY, TELEPHONE ORDERS WILL BE
ACCEPTED ON A FIRST-COME, FIRST-SERVE BASIS
ACCORDING TO THE TIME AND DATE OF THE ORDER

UNITED STATES
RARE COIN & BULLION RESERVE
Distributor of Government Gold. Not Affiliated With the U.S. Government.

©2010 United States Rare Coin & Bullion Reserve

Fire and Ice

ON TUESDAY, FEBRUARY 11, 1958, the temperature at Ellsworth Air Force Base in South Dakota was 15 degrees below zero. I was an electronic countermeasures officer; my crew was making its first flight as a combat-ready crew, with no instructors on board. But I remember the day for a far more significant, and much sadder, reason.

Five other crewmen and I took off in a brand-new B-52D: the pilot, Captain Melvin Rudd; copilot, Captain Verle Rusk; navigator, Captain John O'Connell Jr.; radar bombardier, First Lieutenant Kenneth Kaeppler; gunner, Technical Sergeant Oscar Orrs; and a ground crew member. The mission was about six and a half hours rather than the usual 12 to 16 hours because of a fleet-wide problem in the fuel transfer systems, limiting the fuel available to only that in the wing tanks.

At the time, Strategic Air Command evaluated its units on various criteria, one of which was on-time takeoff. We were on final approach for landing

when we got a call from the control tower, telling us that another aircraft, which had less than five minutes to be on time, was waiting to take off. Could we go around? Rudd said okay and advanced the throttles while Rusk raised the landing gear.

We were at about 500 feet and halfway down the runway when two of the inboard engines flamed out. "Get those engines restarted," Rudd said, and with some difficulty, Rusk did.

Rudd declared an emergency. A series of engine failures and restarts ensued. Rudd tried to keep the aircraft flying and re-enter the landing pattern, and Rusk struggled to keep the engines running. We managed to get back to final approach but could barely maintain flying speed and altitude. The ground control radar operator kept warning us that we were dangerously low. Rudd said that when the stall warning sounded, he would tell Rusk to drop the landing gear.

About a mile and a half short of the airfield, Rudd called, "Gear down." The airplane stopped flying and hit the ground. I raised my eyes and said, "Your will, not mine." We rolled over hill and dale toward the perimeter fence and the guard station at the main gate. On the

way, an engine pod went through a building that housed radio equipment.

A railroad cut lay between us and the airfield. When the front landing gear went into the cut, the nose hit the far side. The aircraft broke in two at some point, and the tail section ended up at right angles to the rest of the fuselage.

We came to a stop. Neither Rudd nor Rusk could open his overhead escape hatch. I don't know if the hatches were jammed or the guys didn't realize how heavy those things are. As for me, first I tried to get up without opening my seat belt. Then I tried to get up without getting out of the parachute harness and survival kit. I stood on the seat and pushed the escape hatch up with difficulty. All I saw was flame.

I headed for the front of the aircraft. On the way, I could see that the lower deck was engulfed in flame, and there was a crack in the floor on the left side, through which I also saw fire. In the meantime, Rusk had gotten his window open and was trying to get out it. Rudd and the ground crewman were following. I didn't think I had time to wait for them. I went back to my seat, grabbed the end of the escape rope, and

After the B-52D crash was solved, over 200 "cause unknown" aircraft losses were attributed to the same condition.



pushed the hatch up but not off so it would shield me from the flames. As I went out and let the hatch fall closed, it caught my pants leg. I hung upside down for a moment, and realized that I hadn't thrown the rope out to slide down on—I still had the end. I made a choice comment and began kicking free of the hatch.

Meanwhile, Orrs had jettisoned the tail turret and took off running, still wearing his parachute. The footprints

A medic got me into an ambulance and began to treat my hands. Rusk and I were taken to the hospital; Rusk was kept overnight for observation. I was sedated while each finger was bandaged. It looked like I was wearing very thick gloves.

Three days after the accident, Kenneth Kaeppler was buried at a national cemetery north of Rapid City. I had someone bring me a uniform from my apartment. The shirt sleeves had to

one of my proudest moments. When the bandages came off for good after three and a half weeks, my fingers worked properly.

After a month off to fully heal, I returned to work on a Monday morning. As I was standing in the electronic countermeasures office, Captain Bob Ballard ran in—he was scheduled to fly in a few minutes and his wife had just had a miscarriage. "Give me your stuff and I'll go for you," I said. I got a flightsuit, boots, and a helmet out of my locker and met the crew at base operations. We flew a routine mission, during which the pilot, Captain Ivan McFadden, made numerous comments about what a smooth landing he was going to make. When we landed, McFadden allowed the front gear to touch first, which is an automatic ticket to bounding almost uncontrollably down the runway. He was mortified, and kept apologizing over the interphone. I said, "Hell, Mac, that was better than the last landing I had." He responded, "You must have crashed [pause].... You son of a bitch, you *did* crash."

The next day, I caught hell for making the flight. Since it had been more than six weeks since I had flown, regulations said I was unqualified to fly without an instructor.

Investigators eventually determined that the crash had been caused by fuel icing, a previously unknown condition in which jet fuel absorbs water vapor from the atmosphere, and at low temperatures the water condenses as ice in the fuel lines. On the B-52, three fuel strainers were installed in each engine pod. Only the first and third strainers had bypass valves to compensate for clogging. The second filter had no bypass. The fuel filters recovered from our B-52 were all clogged with ice. Over 200 previous "cause unknown" aircraft losses were then attributed to fuel icing. The immediate fix was to remove the filter element from the second strainer. Some time later, the Air Force installed fuel heaters in the B-52s' main tanks.

 LEONARD R. SCOTTY

I don't know how much fuel was left in the wing tanks, but the forward body tank just behind my seat had 12,000 pounds of fuel as ballast. It seemed to take the fire crews forever to get to us. I remember crying, and screaming for them to get Kaeppler and O'Connell out.

in the snow went from the turret to the fence and picked up again on the other side; the gate guards caught up to him about a half-mile down the line.

I got loose, and the weight of the hatch dragging on the rope allowed me to slide down without injuring my legs. I was not wearing gloves, so my hands got burned, but at the time I didn't realize it.

I don't know how much fuel was left in the wing tanks, but the forward body tank behind my seat had 12,000 pounds of fuel as ballast. It seemed to take the fire crews forever to get to us. I remember crying, and screaming for them to get Kaeppler and O'Connell out. I didn't know at the time that Kaeppler had been killed when the nose smashed into the railway cut and that O'Connell had died in the flames. Three men doing maintenance work in the building struck by the engine pod had also died.

Rusk managed to get out his window, and Rudd followed head-first and landed on Rusk's back. The ground crewman could not get his parachute off, and broke either the chest strap or the buckle to get free. He too went out the right window, his parachute dangling behind him by the leg straps.

be cut from bottom to top so I could get my bandaged hands through. The coat was draped around my shoulders, and my overcoat went over that. It was another bitterly cold day, near 20 below zero. The only thing I remember about the burial was crying when the volleys were fired. My squadron commander, Lieutenant Colonel Charles Kammer, put his arm around my shoulders and held me tight.

On Saturday, when my bandages were changed, the surgeon tried to bend my fingers. He decided that if I was ever to have a chance to use my fingers, they must be fully bent under the bandages: my left thumb was tucked in and the fingers wrapped around it. Then the hand was bandaged. My right hand was also bandaged in a fist, but the thumb was mostly exposed.

I was allowed to go home for the day on Monday. At lunch time, I looked for something to eat. I had cans of soup in the cupboard, but the only can opener I had was the kind you clip to the top of the can and then twist the handle. I fumbled with the opener, which really required two hands to operate. It was painful, but I kept at it until I got the can open and the soup in a pot. It took about 25 minutes, and it was and still is

Oldies & Oddities

FROM THE ATTIC TO THE ARCHIVES

He Shot California

DURING THE ROARING

Twenties, Los Angeles bigshots hired Robert Earl Spence to take aerial photographs of their homes, paying \$10 a picture. Spence himself did not fly; he hired a pilot and airplane. He would lean out from the open cockpit, focusing his 46-pound camera on his target at an angle instead of shooting straight down. Rather than simply showing roof and treetops, his oblique shots captured the ornamental details of a home and its surroundings all the way to the horizon.

For five decades, Spence leaned out over California and the west, taking pictures that would chronicle the growth of suburbs and freeways, along with harbors, dams, aircraft plants, and skyscrapers. He captured the filming of Cecil B. DeMille's *Ben Hur*, a 1928 football game at the Rose Bowl, the construction of Dodger Stadium, Disneyland as an island in a sea of orange groves in the mid-1950s, and countless marinas sprouting along the coast.

"An inveterate aerial historian" is how John Franklin, former curator of the photographs at the University of California at Los Angeles, once described Spence. "When he flew out to take a picture for a client, he would shoot on the way out and back."

In 1971, at age 77, Spence retired and donated his collection—110,000 negatives—to the university's geography department. Now his negatives are protected in refrigerated vaults in UCLA's Benjamin and Gladys Thomas Air Photo Archives.

Spence saw his pictures used in many ways. As early as 1938, textbooks

on architecture, engineering, and science reproduced them; to this day they show up in books on urban planning, history, and geology.

He made money from promoters too. In 1929, the Los Angeles Chamber of Commerce used Spence's work to illustrate a booklet advertising the delights of the city. Eighty years later, Michelle Marquis, assistant director of marketing of UCLA's Ziman Center for Real Estate, needed an image that would express the center's focus on land development. She chose a Spence photo showing UCLA's tiny campus in 1930 set amid gullies and dirt roads.

The collection is also used in ways that Spence, who died in 1974, could never have foreseen. "What has happened historically on property is incredibly important," says Don Schmitz, a land use consultant in Malibu. Schmitz represents property owners who are frustrated by government regulations. Some agencies can declare an entire property an "environmentally sensitive habitat," and limit the homeowner's ability to modify it, or can simply refuse requests to construct outbuildings, additions, or even homes on their properties.



A 1921 Robert Spence photo of Venice Pier.

Most agencies, however, will allow exemptions if the owner can prove that the property once had a similar structure on it. That's where Spence comes in. "The [written] records are either nonexistent or extremely thin," Schmitz says. "So if you have photographs of a house that used to be there that was destroyed, then you're allowed to rebuild."

Spence photos have also been used to stop landowners from blocking access to roads running through their estates. Old pictures that show picnickers in Model Ts riding along dirt roads establish a pattern of public use and can aid in getting roads reopened.

Environmentalists value Spence's pictures as well. His shots show rivers that have disappeared, beaches changing shape after breakwaters were built, and factories oozing oil or chemicals and creating toxic sites that were torn down or buried decades ago.

Folks still come in to find aerial shots of their grandparents' house, or the bean field where their own home now stands—but today they pay \$200.

✶ ✶ ✶ VICKEY KALAMBAKAL



Pioneering audiologist invents "reading glasses" for your ears.

Neutronic Ear is the easy, virtually invisible and affordable way to turn up the sound on the world around you.

**You don't have to pay through the nose to get
Personal Sound Amplification Technology.**

It's amazing how technology has changed the way we live. Since the end of the Second World War, more products have been invented than in all of recorded history. After WWII came the invention of the microwave oven, the pocket calculator, and the first wearable hearing aid. While the first two have gotten smaller and more affordable, hearing aids haven't changed much. Now there's an alternative... Neutronic Ear.

First of all, Neutronic Ear is not a hearing aid; it is a PSAP, or Personal Sound Amplification Product. Until PSAPs, everyone was required to see the doctor, have hearing tests, have fitting appointments (numerous visits) and then pay for the instruments without any insurance coverage. These devices can cost up to \$5000 each! The high cost and inconvenience drove an innovative scientist to develop the Neutronic Ear PSAP.

**Just think of the places
you'll enjoy Neutronic Ear**

**Parties • Restaurants
Church • Lectures
Book Groups • Movies
Bird-watching and
almost any daily activity**

Neutronic Ear has been designed with the finest micro-digital electronic components available to offer superb performance and years of use. Many years of engineering and development have created a product that's ready to use right out of the box. The patented case design and unique clear tube make it practical and easy to use. The entire unit weighs only 1/10th of an ounce, and it hides comfortably behind either ear. The tube is designed to deliver clear crisp sound while leaving the ear canal open. The electronic components are safe from moisture and wax buildup, and you won't feel like you have a circus peanut jammed in your ear. Thanks to a state-of-the-art manufacturing process and superior design, we can make Neutronic Ear affordable and pass the savings on to you.

It works... but don't take our word for it. Why pay



**Hard to see • Simple to use
Easy to afford**

thousands to make everything sound louder when what you really need is a Personal Sound Amplification Product? We're so sure you'll be absolutely thrilled with the quality and effectiveness of this product that we are offering it to the public at a low introductory price with our exclusive trial offer. If, for any reason, you are not completely amazed by how this product improves your life, simply return it for a refund of the product purchase price within 30 days. Call now.

Visit us on the web at
www.neutronicear.com

NeutronicEar™
The Sound Decision™

Call now for the lowest price ever.
Please mention promotional code 41201.

1-877-763-3305

Neutronic Ear is not a hearing aid.
If you believe you need a hearing aid, please consult a physician

The Evolution of Hearing Products

Invention	Date	Easy to Use?	Invisible?	Affordable?
The Ear Horn	17th Century	No	Hardly	Maybe
Wearable Hearing Aid	1935	weighed 2.5 pounds	No	No
Digital Hearing Aid	1984	No	No	Not for most people
Neutronic Ear	2010	Yes	Yes	Yes

Jump.

Jeb Corliss says if the birds can do it, so can he.

THE DREAM HAS RECURRED SINCE CHILDHOOD: I jump, and I can fly. I'm amazed. There are no awkward flapping wings, no roaring engines, no hang glider over my head. Just me flying, pure and delightful. I'm up and whizzing over the landscape, and it's as simple as that.

"Flying in a wing suit is that dream!" says Jeb Corliss. "It's the closest you can come to real human flight." At home in Venice, California, Corliss is barefoot and dressed in black pajama-like pants and a black T-shirt. His head is shaved, and he's tall and lanky—a bit stork-like. He grabs an iPad and flicks it with his long fingers and there's a video of men—in weird

stretchy suits that

BY CARL HOFFMAN

make them look like giant flying squirrels—streaking through the air five feet over sawtooth ridge tops and banking along stony cliffs, and all I can think is: It's my dream come to life.

The modern wing suit was born in the 1990s, and ever since, wing suit fliers and designers (they are for the most part one and the same) have been nurturing that dream, extending the glide ratio of the free-falling skydiver or BASE jumper (an acronym for Buildings, Antennas, Spans and Earth's natural features, like cliffs). They've pushed it to a bit more than three miles forward for each mile in lost altitude, abetted

by high-tech fabrics and "wings" that channel in-rushing air to create lift.

Alas, a chute must always be deployed. But what if you could jump from the sky and fly through the air and land, just like a bird? Corliss sees that as the purest form of human flight. He wants to be the first person to jump out of an airplane and land safely without a parachute, and make it repeatable.



LEFT: ©AXEL KOESTER/CORBIS; RIGHT: CRAIG O'BRIEN

A person in a black wing suit is shown in flight against a backdrop of a blue sky with white clouds. The wing suit has a circular patch on the chest featuring a stylized bird or wing design. The person's hands are visible at the end of the wings, holding onto the fabric. The overall scene conveys a sense of freedom and aerial adventure.

Fly.

Land.

A wing suit he calls Stealth 2 gives Jeb Corliss (opposite and above, in May 2010 over southern California) enough lift for a three-minute flight from 12,000 feet.

The plan has a lot of ifs, and the biggest is money. He needs about \$3 million to erect, in the middle of the Las Vegas strip, a ramp hundreds of feet tall. It would look like a ski jump, but act as a landing slope. Since Corliss would bellyflop on it head forward, arms back, he's found it difficult to persuade people with deep pockets to finance what, after all, could become a televised suicide.

The notion of fatality aside, however, any discussion about landing without a parachute has to start with this fact: Ever since the invention of the airplane, a few people have fallen out of the sky without parachutes and lived to tell the tale. Nick Alkemade, a Royal Air Force tail gunner, jumped from his flaming turret in 1944 without a parachute and fell 18,000 feet into Germany. When he came to, he saw stars overhead and, with no more than a sprained leg, lit a cigarette. Alkemade's luck? Fir trees, underbrush, and snow.

Three decades later, a terrorist's bomb blew up a DC-9 flown by Yugoslavia's JAT airline, and Serbian flight attendant Vesna Vulovic fell 33,000 feet. She landed in snow and lived. There have been others. Roy Haggard, a longtime aerospace engineer and chief technologist at Hunter Defense Technologies in Solon, Ohio, says, "If it's been done by accident with an incredibly low probability of success, well, it just becomes an engineering problem, and not a stunt, that in fact has a statistical probability of success."

AT THE HEART of Corliss' plan lie the challenges inherent in the human body's design. While even large birds are light as a feather, with hollow bones and long, wide wings, humans are dense objects, with long, heavy legs and short, heavy arms—and no wings. Corliss recites a history starting in ancient times of wingnuts who jumped from buildings, often to their deaths. Today,

the closest thing to pure flight remains a hang glider. It avoids the problem of our physiology with a set of big, relatively rigid wings. When the first modern wing suit flier, a French skydiver named Patrick de Gayardon, created a nylon jump suit in the mid-1990s with fabric between his legs and extending from his wrists to his waist, with open cells that gathered air, he suddenly had the first suit that served as an airfoil. De Gayardon managed only a 1:1.3 glide ratio, little better than a skilled skydiver in freefall. He died in a fall in 1998 when a new packing method he was trying for his rigging caused it to fail, and left unrealized his dreams for the potential of wing suits.

A year after de Gayardon's death, a Croatian, Robert Pecnik, became the first person to manufacture and sell wing suits. Over the next decade, surface area increased. The wings of today's suit extend from the wrists to the ankles. Short of adding appendages to the human body, designers cannot add surface area. This is where wing suit art and wing suit science collide. Using wind tunnels for research is difficult because the dummies would be static and rigid, whereas real wing suit flying involves humans flexing muscles and moving the hands, arms, legs, feet, and head. Also, the tunnel's air stream flows in one direction, while a wing suit flier is dropping and moving forward. And a theoretical test body, a mannequin, has to be scaled to exactly 40 percent of the diameter of the tunnel to get the right air flow. The wing suit community is so small—maybe 600 worldwide, Pecnik estimates, with a mere 40 or 50 who "proxy," or fly close to cliffs and buildings—that there's just not enough money for the kind of research that might significantly increase glide distances.

All of which means that Jeb Corliss, flying the best suit money can buy (about \$1,500), will be hurtling downward and forward hard and fast. He's got lift, for sure, but he'll be traveling at more than 100 mph, dropping a foot for every three feet forward. It's the maximum glide angle, and one at which he can't get more lift; he can't suddenly flare up while screaming in toward a landing. "An airplane comes in at a certain approach speed and the pilot pulls the stick back and flares, and that neutralizes the sink rate,"

Epiphany: A dozen-odd flights ever closer to Rio's Christ the Redeemer in 2007 convinced Corliss he could land on a ramp.



PATRICK MCFEELEY



LOÏC JEAN-ALBERT

says Mark Maughmer, a professor of aerospace engineering at Pennsylvania State University. “You’re trading the airspeed you have, its kinetic energy, into potential lift for a moment.” But Corliss will have precious little flare. Which is why wing suit fliers on proxy flights don’t, in fact, go for maximum glide angle, so they have a little something in reserve in case they need to swoop over and away from objects. Corliss, then, will travel even faster, and that’s the essence of the challenge: Come in for a landing so fast with so little lift that his abort options are extremely limited.

In person, Corliss doesn’t come across as crazy. Passionate, yes. Driven. Dedicated to sucking the most out of life, and resistant to the rules that keep most of us inside an airplane until it lands. He is deep-voiced and loud, a kinetic presence. No odd loner, he has a girlfriend and a mother who support his passion. He grew up all over the world and was home-schooled after the sixth grade by art-dealer parents. At an early age he grew fond of snakes and danger; even now his other passion besides BASE jumping and wing suit flying is hanging around wild predators. Skydiving bored him. “It’s pointless,” he says. In his early

20s he turned to BASE jumping, which “begins where skydiving ends.” Skydiving is a regulated sport: A parachute must be deployed by 2,000 feet, and divers must jump with two chutes. A BASE jumper’s fall is so short, often from heights starting below 2,000 feet, that there’s no time for an emergency chute; they carry just one. Corliss was BASE jumping in Italy in 1998 when he saw his first wing suit flight. “I

Birds of a feather: Pierre Desmet flies on his back with Stéphane Zunino above him over southern France.

jumpers open a parachute, land on a second ledge too big to clear in flight, then jump again. “But if you had a wing suit,” Corliss says, “you could jump and then fly over the second ledge.”

A Russian friend of Corliss’ jumped and

THE NOTION OF FATALITY ASIDE, HOWEVER, ANY DISCUSSION ABOUT LANDING WITHOUT A PARACHUTE HAS TO START WITH THIS FACT: EVER SINCE THE INVENTION OF THE AIRPLANE, A SMALL NUMBER OF PEOPLE HAVE FALLEN OUT OF THE SKY WITHOUT PARACHUTES AND LIVED TO TELL THE TALE.

watched a guy jump off and fly away and it looked like a long glide. It was instant: I thought, This has the potential to change the world of flying for humans without airplanes.” He called Pecnik and bought his first suit, flew it 10 times out of an airplane, and headed to South Africa. BASE jumping friends said they knew of “an amazing cliff” there that overlooked a series of descending ledges. Ordinarily,

soared right over the second ledge. “He made it, and it was like seeing the impossible! I mean a year before, it couldn’t have been done, and at that moment I learned that the impossible doesn’t exist.” Then Corliss leapt, his first BASE jump with a wing suit. He soon realized he didn’t have enough lift to make it over the second ledge, and he was too low to open his parachute. Luckily, perpendicular to the ledges was “this giant



crack that dropped downward." He banked left and dove into that gorge and was suddenly proxy flying like a spacecraft in *Star Wars*, a man with no aircraft coursing through a crack in the Earth. "Dude, that flight was oh-my-God crazy and I was like instantly, wow!" No sooner had he popped his chute than he was analyzing his flight, which had tracked above a long slope, fol-

could set down with ease, but I'd be traveling at 100 miles an hour, and once down I'd have no control. Too much friction. Too high a probability of tumbling. Too many variables that I couldn't control." The problem remained a high approach speed with few options, and only a fraction of a second to decide whether to land. "You have to deploy a parachute at 200 feet in

a TV crew in Brazil asked him to jump from a helicopter and fly by the hand of Rio de Janeiro's 130-foot-tall Christ the Redeemer statue, itself atop a 2,300-foot peak. He'd have to fly just beneath the arm and then clear the fence surrounding the statue's base. He wasn't sure he could do it for the same reason he fretted about a landing someday: Would he be traveling too fast to hit the requisite marks? "There are just too many decisions for a human to make in a hundredth of a second," he says. In a series of practice flights he flew closer and closer to the arm until he had an epiphany: The statue gave him three-dimensional reference points during his rapid descent. By the third run he knew he could do it, and the next day he made eight flights, which he shows me on a video. In it, he's a bullet screaming just under the arm and barely six feet over the fence. After that, he knew two things: "I knew how accurate I could be, that I could hit a six- by six-foot window easily," he says. "And I had to build something like that statue that would show me where I was in space."

Taking some of Roy Haggard's advice, Corliss came up with a plan of attack, which he's reluctant to describe in too much detail. He would build a landing ramp made of tightly stretched fabric attached to a 40- to

"WHAT JEB IS TRYING TO DO IS CONCEPTUALLY POSSIBLE WITH THE PROPER ENGINEERING APPLIED, AND AS LONG AS HE LISTENS TO THE DATA. SAFETY IS RELATIVE; JUST FLYING IN AN AIRCRAFT HAS A STATISTICAL PROBABILITY OF FAILURE."

lowed by a quick break to one side when he realized he needed to change his path. With that level of control, he thought: *Man, I could land one of these things.*

In 2003, he began to explore every conceivable option. He looked at nets, but unless he could land on his back, the possibility of breaking his neck seemed too high. He looked at plowing out a long runway on a snowy mountain slope. "I

order to use it, but above 200 feet you're too high to know if you're lined up right. You don't have the depth perception, and you're traveling faster than your mind can make decisions, so you really don't know until you're five feet above the landing zone, but then it's way too late for anything. A pilot's basic training is go-arounds, but there aren't any go-arounds in a wing suit landing. I was stumped."

By then Corliss was a professional BASE jumper, earning money for everything from video footage of proxy flying to hosting a show on the Discovery Channel. In 2007,

Corliss inspects a wing suit in Perris Valley, California. He insists that every jump is backed by serious risk evaluation.



©AXEL KOESTER/CORBIS

60-story building, beginning at a 45-degree angle—a 1:1 glide ratio. (Haggard thinks that's too steep.) The building and ramp would provide that 3D reference to which he could line up as he hurtled downward. The angle would give him control options, because he could vary his rate of descent up to a 3:1 glide ratio. And because the approach end of the ramp would be between 400 and 600 feet high, he would have the time and altitude to act on any doubts, peel away, and pop his chute. He had his go-around. "Look," Corliss says, pulling up a video of the world record ski jump. "He's flying 239 meters with an air time of seven seconds, and this shows that you can be in free fall at a high speed and safely set down and do it over and over again." Corliss selects another video of motorcycle racers crashing in protective suits—their bodies skidding and tumbling at high speed across pavement—and then walking away. "Once you set down, there's a lot of friction and it can melt you in your suit, but these crashes show that with the right protective gear with a rigid neck brace in conjunction with a wing suit, well, you can deal with the friction."

TO PAY FOR IT ALL, he needs sponsors, and that means crowds and television. "A cliff somewhere?" he asks. "There's no money in that!" So he came up with Vegas, baby, home of the outlandish and the big gamble, and plenty of tall buildings. "We could have 500,000 spectators and suddenly that \$3 million price tag doesn't seem so big. I mean, imagine summiting Everest for the first time in front of a huge crowd!"

For Haggard, it's plausible, but beyond his comfort level. "What Jeb is trying to do is conceptually possible with the proper engineering applied, and as long as he listens to the data. Safety is relative; just flying in an aircraft has a statistical probability of failure." There's no good comparison, Haggard says, even with the space shuttle, which has a lot more flare and lands on a horizontal runway. "Jeb's current approach mimics a ski jumper's," he says. Haggard, whose current company's policies don't allow him to work with Corliss, has doubts about Vegas. "If he wants to exit an aircraft and land without a chute, there are easier options," like a wing suit with a higher glide ratio. "The ramp or mountain is his glide slope," says Maughmer, the Penn State aerodynamicist. "He's got to kiss it

perfectly and he'll have a lot of speed to bleed off." Maughmer laughs. "If you need the short answer, yeah, this is possible. I would say it'd take about, I don't know, a fifth or slightly more of gin. But you could do it."

Corliss has a very specific goal, and it's not only to land without a chute, but to land at high speed and to do it in a wing suit that has no additional appendages. "I'm not interested in anything with a

but a wing suit has to be able to be folded up and put in an airplane, and there are safety issues with rigid extensions, and well, that is a hang glider, not a wing suit." Corliss, he says, has plenty of courage and ideals. "But I fear it will not go as planned."

Corliss is undeterred. He leaps from a


In 2009 at Lake Elsinore, California, 68 suiters set a formation record. This core of 36 hung together for a few more seconds.



MARK HARRIS/RAISE THE SKY

rigid wing, and I don't want anything with a 7:1 glide ratio." If some other flier beats him, he says, it will be on that snow-covered mountain "by someone who doesn't worry about the consequences. But to me that act has a 1-in-10 chance of success, and that's too risky. I want to do it over and over again and walk away each time."

Robert Pecnik, the wing suit maker, appreciates Corliss' desire to use only a standard wing suit, but the endeavor itself makes him nervous. "The human body is not designed to fly," he says. "It takes a stronger and stronger effort to succeed very little. Better wing suit technology will push us to a 1:4 glide ratio, maybe,

chair, stretches his six-foot-three frame, and paces the room. "My job is risk evaluation," he says. "I go to a building before a jump and my very first job is to figure out the risks, and it's the only thing I think about. It's about solving problems and combining skill and technology to do something that's never been done before. The key to happiness is having dreams and fulfilling them, even if my dreams are your nightmares." He brings up Otto Lilienthal, the 19th century German aviation pioneer who killed himself trying to fly one of his contraptions. As he lay dying, he said, "Small sacrifices have to be made." Says Corliss, "I think that's beautiful." 



FLYING BATHTUBS Sell Like Hot Cakes

THE NATION'S FIRST MASS-PRODUCED LIGHTPLANE STARTED AS A HOMELY, HUMBLE HOMEBUILT. BY GILES LAMBERTSON

EVEN DURING THE EARLY YEARS OF FLIGHT, when aircraft design was influenced as much by whimsy as by aerodynamics, Jean Alfred Roche's serious little airplane was considered comic-looking.

Its bluntly tapered front end and button nose cleaved the air just forward of a low-side open cockpit in which the pilot essentially sat on the floor, leading some wag to christen it the Flying Bathtub. One can easily imagine a cartoon character sailing along in it, merrily scrubbing his back, soapsuds spilling out.

Appearances notwithstanding, the squat little aircraft launched a company and spawned a market for simple, lightweight airplanes for Everyman.

Jean Roche surely was the least surprised of anyone by the airplane's success. The Aeronca C-2 was the culmination of his vision for a cheap and easy-to-fly airplane. As the Great Depression settled in, sales of the C-2 took off, buoyed by the craft's affordability—under \$1,500—and its quirky spirit.

Of 164 C-2s sold in 1930 and '31, just 15 or so are still around—the “or so” covering the ones in pieces. Several fully restored C-2s are in museums. Only a handful are flying, and at least one is about to.

IN 1956, chance led Bill Smela, an 18-year-old airport apprentice, to a damaged C-2 for sale. He bought the airplane for \$600, but didn't get around to repairing it until two years later. When he was nearly done, a friend's wife backed a car into it. The mishap would ground the Aeronca for another 50 years.

Smela and his wife, Mary Jo, operated a succession of small airports, and he restored several aircraft, but the C-2 remained untouched. Finally, in 1997, Smela let it go. Dean Kramer, a United Airlines pilot from Bernville, Pennsylvania, called, and Smela first tried to sell him another aircraft. Unsuccessful, he reluctantly said, “I have one other plane you might be interested in: a Flying Bathtub.”

Smela now works intermittently at restoring the aircraft for Kramer. “The deal we cut is that he does the restoration, and he gets to take the first flight,” Kramer says. For now, the airplane sits inside an 18th

COURTESY CRAIG MACVEIGH (2)



century stone building behind Smela's New Jersey home.

Ten years after Smela bought the Aeronca, when he was working at an airport in Pennington, New Jersey, in exchange for flying lessons, he had an unexpected visit from the designer himself, Jean Roche. "I understand you have an Aeronca," Smela recalls Roche saying, by way of introduction. He then reminisced at length about the airplane, which he had created more than 40 years earlier.

"He pointed at the gas tank and said, 'See that? That's a mailbox,' " Smela recalls. Roche explained that when he and his partner needed a gas tank, they soldered shut a mailbox, cut a hole in the top, capped the opening, and hung the box in place.

JEAN ROCHE WAS 12 when he and his family arrived in New York from France in 1906. At age 17, after tinkering with model aircraft and gliders, Roche applied for the first of what would be 20 patents. Four years later, he earned an engineering degree from Columbia University and began designing aircraft for a living. In 1917, the U.S. Army Signal Corps' Aviation Section settled at McCook Field in southwest Ohio, and Roche with it.

McCook housed the first center for research on military aviation. Nearby Dayton was home to the Wright brothers. All this inventiveness fueled company start-ups and home-based airplane projects alike. In a garage at 28 Watts Street, Roche and McCook colleague John Q. Dohse pieced together what they called the Roche-Dohse Flying Flivver.

This was to be a personal aircraft: It weighed about 400 pounds and measured 20 feet nose to tail, with a single, high wing spanning 36 feet. Behind the cockpit, the sides of the cotton-fabric-covered fuselage converged in a narrow spine, which ran from the trailing edge of the wing to the base of the vertical stabilizer. The triangle-shaped fabric enclosing the area behind the pilot's seat was reminiscent of a pup tent. This distinctive "razorback" body was modified to a more rounded appearance in later Aeronca models.

A tubular bipod jutted above the cockpit with hanging wires running to each wing, supporting the wings when at rest. Two sets of streamlined flying wires connected the underside of each wing to the fuselage, anchoring the wings in flight.

There was no windshield or brakes (to slow the aircraft, the pilot had to reach out with gloved hand

Craig MacVeigh's grin says it all: "I ♥ My Aeroncas – All 11 of Them." His C-2N (opposite, after restoration, and above, wingless while undergoing minor repairs) was built in 1930 and wore the standard C-2 orange and yellow paint.

and grab a tire), and only meager instrumentation. The cockpit had a plywood seat, a stick to move the ailerons and elevators, and a foot-operated rudder bar that pivoted like the steering mechanism on a child's sled. Spoked buggy tires carried the forward fuselage; the tail sat on a metal skid. An engine eventually would sit at the apex of the aircraft's slanted front end. But first, Roche had to find an engine.

He tried one from a Henderson motorcycle, the fastest bikes of the era, but the four-cylinder engine could not get the airplane off the ground. Roche then asked another McCook colleague, Harold Morehouse, to build a suitable powerplant. In 1925, the airplane was fitted with Morehouse's new 29-horsepower, two-cylinder gasoline engine and moved to nearby Wilbur Wright Field for testing.

During a September 1 taxiing test, Dohse inadvertently gave the Morehouse too much throttle and the airplane lifted off. Finding himself in the air, Dohse decided to stay there. He climbed and circled, then landed. After backslapping, the trio went back to work. Some 200 flight tests followed.

A crackup in 1926 destroyed the Morehouse engine. Morehouse had left McCook, so Roche turned to two other Army engineers, Robert Galloway and Roy Poole, who built a 107-cubic-inch, two-cylinder engine producing 26 horsepower. It became the aircraft's standard powerplant.

In November 1928, several business and political luminaries—among them Dow Chemical and Drug Company executive I.C. Keller and eventual U.S. Senator Robert A. Taft—formed the Aeronautical

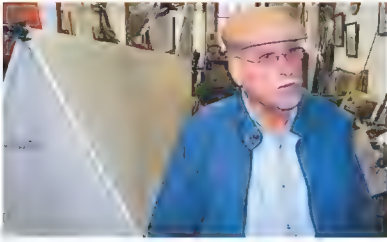
Corporation of America in Cincinnati and scouted around for an airplane. Their search took them to Wright Field the following spring for a demonstration of what by then was more soberly called the Roche Original. While Dohse put the Original through its paces, Roche plied the watching VIPs with his aeronautical knowledge. Aeronca (the shortened corporate name became official in 1941) had its airplane.

Except for being fitted with a windshield and overhead win-

A cheerful John Dohse (left) and Jean Roche and a dour Harold Morehouse posed in 1925 with their Roche Light Plane. Below: The 7AC Champion, the best-selling descendant of the C-2, gave a generation of pilots their first flights.



TOP: COURTESY AERONCA, INC.; BOTTOM: NASM (SI NEG. #78-7870)



Bill Smela was an 18-year-old airport apprentice in 1956 when chance led him to a damaged C-2 for sale. He bought the airplane for \$600, but didn't get around to repairing it until two years later. When he was nearly done, a friend's wife backed a car into it. The mishap would ground the Aeronca for another 50 years.

dows and having its assembly modified for mass production, the prototype emerged from the adoption process virtually intact—except now it was called the Aeronca C-2.

BY THE LIGHT of a battery-powered lantern, Edward Wynkoop Stitt squinted at an unscrollled map in his lap. It was July 1937, and Stitt had taken off in his C-2 from Columbus, Ohio, with an extra 30-gallon fuel tank behind his seat.

Bill Smela (above) shows off the razorback fuselage of the C-2 he's long been restoring; below, in Smela's shop, the mailbox fuel tank sits atop the sparse instrument panel.

He was trying for a light-airplane distance record, but for two days the C-2 had bucked strong westerly winds. Night had fallen and Stitt was having difficulty holding a fix on an airmail route beacon. Headwinds kept the little airplane more or less hovering. Furthermore, the C-2's engine was sputtering. Stitt unknowingly was pumping too much oil into

it from a reservoir next to his seat and fouling its sparkplugs.

As he leaned out into the night for another look ahead, his attention was drawn to an iridescent field amid dark timberland. An open area of prairie grass shimmered tantalizingly. The weary Stitt conceded defeat. He descended to the field, realizing too late that among the tall grass were scattered tree stumps. The rolling C-2 struck one and flipped. The damage to airplane and pilot was minimal.

At dawn, Stitt elected to stay with the downed machine. The next day, low on water, he ventured into the surrounding woods and came across a man riding a horse-drawn log. He hailed the startled woodcutter and rode the log toward civilization, which turned out to be Booneville, Iowa.

Stitt had set a new National Aeronautic Association-verified distance mark for light aircraft, having flown almost 584 miles, eclipsing the 449 miles he had logged in a flight two years before. Still, he was chagrined. He had landed with at least 10 gallons of fuel remaining. With better luck, he could have



GILES LAMBERTSON (2)





“It is a delight to fly,” says Mike Haynes. “If it is trimmed out, you can take your hands off the controls and steer with the rudder. That’s what makes it joyous to fly, just looking around at everything, seeing the deer run in the woods.”

gone on, making it all the way to, say, Omaha.

Stitt told that story in 1956 to an 18-year-old Bill Smela, who had come to his auto upholstery shop near Trenton, New Jersey, to price a new top for his Model A Ford roadster pickup and was drawn to a photo of Stitt standing by an airplane. Shortly thereafter, Smela came back with \$600 and bought the C-2.

EVEN DISASSEMBLED, the C-2 has tales, which Smela tells as he walks among the pieces in his shop. The lower portion of the airplane’s aluminum cowling, which Smela has replicated, was missing after being battered by, perhaps, an Iowa tree stump. Smela fingers a reinforced fuselage strut that had been fractured, possibly in that same adventurous landing. He was told that the two pistons in the E107-A engine were manufactured by the Indian Motorcycle Company. The engine’s cam lifters are stamped “Buick.” In 1930, airplane engines used both original engineering and gleaned parts.

Smela once actually flew a C-2—not his own. “It almost flew itself,” he recalls. Mike Haynes, an Alabama pilot, pretty much concurs. Haynes specializes in restoring aircraft and other antique machinery, and calls the C-2 “very easy to fly, very forgiving, very docile.”

It climbs slowly, Haynes acknowledges, “but once you get it up there and are cruising above the trees, it is a delight to fly. If it is trimmed out, you can take



The postwar 11AC Chief (above, with a side of cheesecake) had 75 percent of parts in common with the Champion. Left: In 1930, Paul Clough, 16, took a C-2 “powered glider” from Long Island’s Roosevelt Field to an altitude of 10,525 feet.



In 1959, Robert Cansdale found the C-2, at 400 pounds, an easy pickup (left). His Bathtub now hangs in Seattle's Museum of Flight. The C-2 in the National Air and Space Museum, restored in 1977 (below), was the second one built; the first went to Jean Roche.

your hands off the controls and steer with the rudder. That's what makes it joyous to fly, just looking around at everything, seeing the deer run in the woods."

The C-2's wing and fuselage proportions are akin to those of a glider—Jean Roche's first love—but Haynes says it really is "a power airplane. I had to carry 1,900 rpm [engine power] or else it was coming down."

The glide rate might have been affected by the size of the pilot. Haynes says when a C-2 hauled around his 230 pounds, he couldn't land slower than 45 mph; a lighter friend consistently landed at 35 mph.

At six feet four, Rick Durden jokes that when he clambers past the flying wires and into the little Aeronca, it is not a "graceful" sight.

Durden flies numerous modern and vintage aircraft. The Coloradan has logged more than 7,000 hours aloft, some of it in open-cockpit Aeroncas. "If you have flown anything in that era, you realize they didn't understand anything about stability and control," he says. "Control harmony didn't exist. Stability didn't exist. This [C-2] was a big step forward for the time. It might not be the best today, but it was so much better than anything else then." Genealogically speaking, Durden says the C-2 "begat" some of the classics of general aviation: Taylorcrafts, Piper J-3 Cubs, and Aeronca Champions.

"What is phenomenal about the aircraft is that the engineering that went into it is so elegant," says Craig MacVeigh of Seattle. MacVeigh owns 11 Aeroncas, including a recently purchased C-2. He is a board member of the National Aeronca Association; a board peer affectionately calls the ex-Marine Corps aircraft maintenance officer "our resident C-2 nut." MacVeigh also has a pair of C-3s, the C-2's two-place successor.

"The plane wasn't just something that Roche slapped together from a 1910 *Popular Mechanics* magazine," MacVeigh continues. "He did some very, very serious engineering, efficient engineering."

Bob Hollenbaugh, an Aeronca engineer for 40 years,



DANE PENLAND

says, "The C-2 and C-3 and virtually all Aeroncas were configured with two lower longerons and one upper longeron. They used the triangular fuselage because structurally it was a better configuration, stronger than a box type."

Three longerons—the fuselage's primary longitudinal members—indeed were a genetic marker for Aeroncas. The signature framework remained even after wooden stringers were attached to later models to soften the lines for aesthetic and aerodynamic reasons. The C-2's lineage, in other words, is in the bone structure.

After producing more than 17,000 airplanes in 55 models, Aeronca quit in 1951, turning to components for commercial and military aircraft, missiles, and space vehicles. In July 2008, Aeronca, which had been acquired by Magellan Aerospace in 1986, was awarded the contract to develop heat shields for NASA's new Orion crew exploration vehicle. If the contract is not canceled in a shift of priorities for the space agency, Aeronca will build the shields in its Middletown, Ohio facility, where, since it relocated there in 1940, it produced more than 10,000 of the Flying Bathtub's most famous successor, the Aeronca Champion. ➤

BROOKLYN'S JEWEL:

Floyd Bennett Field

A NATIONAL PARK SERVICE
PROJECT RECLAIMS
AVIATION HISTORY.

BY DAVID SHAFTEL



LINC HALLOWELL remembers driving past Floyd Bennett Field, New York City's first municipal airport, as a young boy on his way to Rockaway Beach in the late 1960s. Back then, the field was an active U.S. Navy base, and it sparked his interest in aviation history. "I just thought, *That is so cool*," says Hallowell, 46. "Seeing the aircraft got me started building model airplanes and then researching the aircraft and getting their stories. But it was an active air station, so you couldn't go in."

Ten years ago, Hallowell, a ranger with the National Park Service, got the opportunity to transfer from



TOP: LIBRARY OF CONGRESS; LEFT: COURTESY TIMOTHY VOGEL

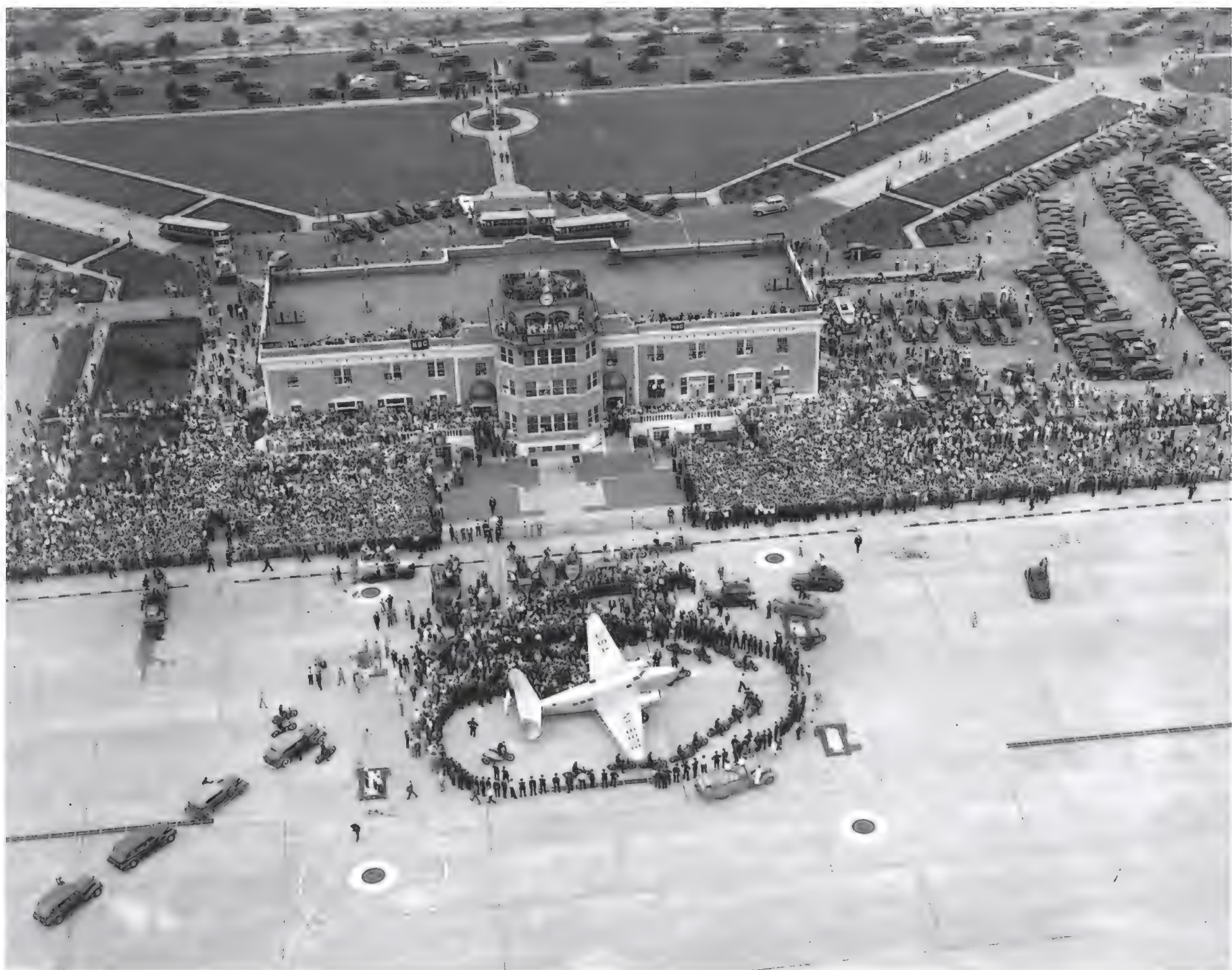
Ellis Island to the Gateway National Recreation Area, a group of historic sites in New York Harbor that includes Floyd Bennett Field. He leapt at it. “Now I’ve got the run of the place,” he says, pointing out that Gateway’s attractions range from the natural (pristine beaches and a wildlife refuge) to the human histories of a Colonial-era lighthouse and a 19th century military fort. The problem, however, is that the human element at Floyd Bennett Field—its hangars and terminal building, dating to 1931—has been left to crumble. Finally, though, after fits and starts, a period-faithful restoration of the now-down-at-the-heels terminal building has begun.

The restoration has been in the works since 2007, when Anthony Weiner, a U.S. representative from New York’s 9th district, secured a \$4.8 million grant to pay for the renovation of the terminal, now known as the Ryan Visitors’ Center. Hallowell has long pined for the restoration, lamenting daily the state of the red-brick, municipal-style building with Art Deco fixtures and flourishes, some of which are still in place. Patches of elaborate stencil work are faintly

visible beneath layers of paint. But now, with a new roof completed, the various building permits affixed to the front doors, and the building evacuated of park employees, Hallowell believes the transformation is finally under way. Urban archeologists hired by the park service have begun to chip away the paint to determine the original colors. “It’s not like redoing the kitchen at your mom’s house,” says Hallowell.

Floyd Bennett Field was named after the pilot who flew American explorer Richard E. Byrd on an attempted trip to the North Pole in 1926 in a Fokker F-VII. The field’s nine buildings—most of them hangars, all but one in disrepair—were dedicated in 1931 beneath a flyover by hundreds of airplanes, which the *New York Times* described as “soaring like a swarm of insects over the sea.” During the next eight years, pilots chose the field as the departure point or destination for dozens of record-setting speed and distance flights. Its location along the eastern seaboard made it a good jumping-off point for transatlantic and transcontinental adventures. Aviators such as Jimmy Doolittle, Jacqueline Cochran, and Howard Hughes were attracted by the

Opposite: A faded hangar’s grand scale hints at the earlier prominence of the field, named for pilot-adventurer Floyd Bennett. On July 14, 1938, thousands gathered for the return of Howard Hughes, who in four days had flown a Lockheed Super Electra around the world (below).



NASM (RUDY ARNOLD PHOTO COLLECTION; SI NEG. #0XRA-4766 PM)

airport's long, paved runways—ideal for takeoffs by fuel-laden aircraft.

Inside the terminal building, Hallowell points out the amenities available when air travel was a more luxurious experience: A newsstand, a lounge for passengers and pilots, a restaurant with French doors, a telephone room, a barbershop, a Western Union office, a press room, and a stained-glass ceiling. All will be restored.

The work will be done in stages, says Gateway unit coordinator Dave Taft, who is overseeing the project. Besides the roof, the first phase will consist mainly of restoring and reopening the ground floor of the terminal, which will be stocked with kid-friendly exhibits with lots of interactive, moving parts (these have the added benefit of being less costly to maintain than electronic exhibits). Taft estimates that the building will be open to visitors by next summer at the latest. During the second phase, the basement and upstairs wings of the building will be restored and used as office and meeting space for park employees. After that, the park hopes to restore a tile-lined underground tunnel, which once served as a passage between the terminal and outdoor boarding area to keep passengers from wandering into the path of taxiing airplanes. The tunnel resembles a New York City subway station. Finally, the control tower will get a makeover.

Hallowell has contributed to the project by conducting archival research. Crucial have been the archives of Rudy Arnold, Floyd Bennett Field's resident photographer, many of whose photographs will hang in the terminal. "This was the center of the aviation universe for about 10 years," says Hallowell. "Every time you go through a news archive, you

find something you didn't know. There's a great picture of Wiley Post, Amelia Earhart, and Laura Ingalls in the restaurant, sitting there eating lunch. There they were, eating soup in a room I'm in and out of every single day."

Some of the buildings at Floyd Bennett have their own ecosystems. "If you neglect the structures, they will go back to the natural," says Taft. "Birds will nest in the cracks. But they really knew how to build things back then. The runways are three feet thick with concrete."

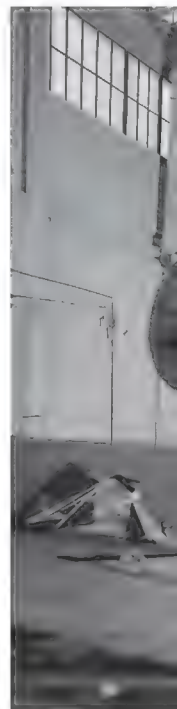
Taft is quick to point out that as a commercial airport, Floyd Bennett Field was not successful. Newark Airport in New Jersey was—and still is—more accessible from Manhattan, and as such got more commercial aviation business. "Floyd Bennett was an airfield in the middle of nowhere," says Taft. "The nowhere just grew up around it."

In 1941, the field was granted to the federal government for wartime use, and it remained an active naval air station until 1971, when

Years of neglect have left the airfield's hangars in shambles (right), but there are currently no funds to mount a restoration. The buildings once hosted aviation celebrities like racing pilot Jimmy Wedell (below, in the cockpit of a Wedell-Williams 44 on November 10, 1933). The hangars were spacious workplaces: A Douglas DC-2 transport undergoes maintenance (top).

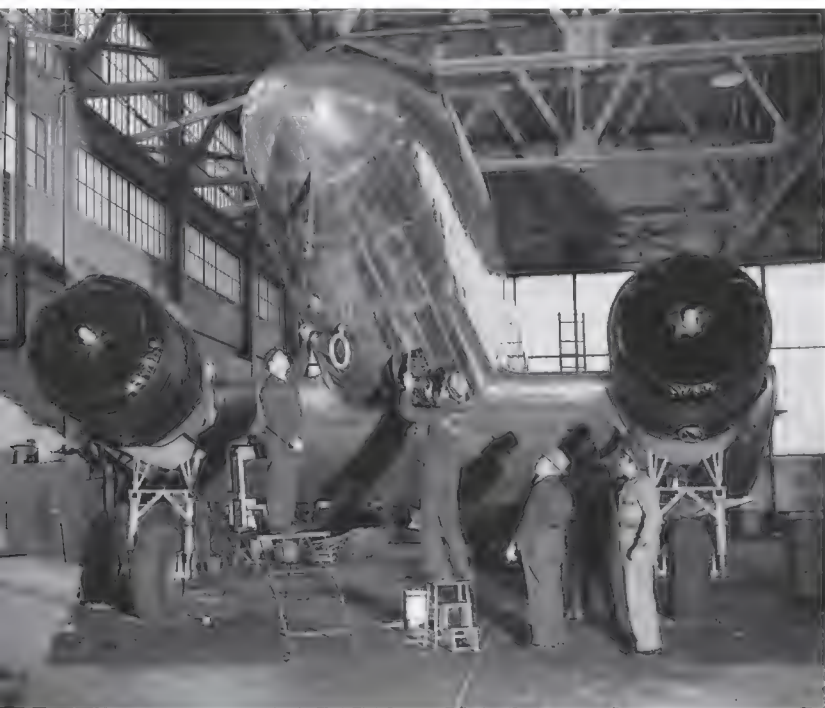


NASM (SI NEG. #89-2223)



it was brought into the Gateway fold. The restoration, however, will focus on the airfield's municipal era. "We have a pretty compelling aviation history," says Hallowell, "but if you think of aviation sites within the park service, you're going to think of the Wright

brothers, Kitty Hawk, and Dayton aviation. Unless you are an aviation history buff, Floyd Bennett is probably not going to be on the top of your list. So we're really looking forward to being able to have this terminal building where somebody like me can



NASM (RUDY ARNOLD PHOTO COLLECTION, SI NEG. #XRA-3910)



NASM (SI NEG. #78-17674)



JAKE DOBKIN



NASM (SI NEG. #78-1875)

The airport's long runways (above) attracted record-setting pilots, but its out-of-the-way location, near Jamaica Bay, discouraged airline passengers. After flying a Waterman Arrowbile across the country in 1938, pilot Jerry Phillips (left) ended the journey at Floyd Bennett's terminal, which is being restored.

say, 'Hey, come on in. Let me tell you the story of the field.' "

After listening to a briefing from a park ranger in a lovingly restored terminal building, visitors can walk out to the tarmac and see things much as they were in the 1930s—the field surrounded by wetlands, no skyline in sight. The only things that could possibly disrupt the reverie are the low-flying jumbo jets on their approach to John F. Kennedy International Airport and a nagging anxiety about the traffic that awaits on the Belt Parkway, heading back to the city. ➔

Throttle Down *How Florida's Space Coast is bracing for the end of the*



space shuttle program. by Tom Harpole | Photographs by David Burnett/Contact Press Images



Space shuttle *Atlantis* was poised for its final mission in May as photographers jostled for position. Their opportunities for good shots dwindle as NASA wraps up its longest manned program.

FLORIDA RESIDENTS LIVE with uncertainty and vulnerability. Chances are good that any family living today on the state's coast has witnessed the damage caused by a hurricane. Those living along the Space Coast—primarily in Brevard County—have a new storm to weather, though like Florida's hurricanes, it's nothing they haven't seen before. When President Richard Nixon announced the end of the Apollo program in 1972, "people just left the key in the front door and headed to Seattle or Denver to try to get on somewhere else where their skills transferred," recalls Leroy Solid, then a NASA project manager. Now with the space shuttle program ending, many of the more than 13,000 employees and contractors at NASA's Kennedy Space Center stand to lose their jobs. (This month, prime contractor United Space Alliance cut its 8,100-person workforce by 15 percent, with 902 jobs lost at KSC.) Though some members of Congress are attempting to add up to two extra shuttle flights, estimates say that up to 9,000 people who have worked on the space program in some capacity will lose their jobs. A domino effect from those losses could cost another 14,000 jobs in retail, local government, and other services. Some KSC workers have eminently transferable skills and will move into other industries. Others, especially those whose jobs are shuttle-unique, confront a bleaker prospect: retraining, forced retirement, or the unemployment line. All face a change in the coming year. Here's how some will cope.



▲ **Tony Sabatino** has been a crane operator in the Vehicle Assembly Building for 28 years. "When you're lifting something worth billions of dollars, you aren't really thinking about how cool that is, but you're more concentrating on that next 128th of an inch where you want the orbiter to go," he says. "I lift the shuttles about 400 feet into the high bay to stack them onto the tanks [and boosters]. At one point, I turn them 45 degrees and there's a few inches of clearance for the wings." Sabatino adds that there's never been a mishap in the VAB. When the shuttle program ends, he wants to go sailing for a couple of years and then get back into operating a crane for a construction company. "But like everyone else," he says, "I'll never have another job this amazing, this important."

▲ **Buddy Rogers** has worked various jobs at KSC for 27 years, the last 11 as a hypergolic technician. His job is to fill the giant external tank that fuels the shuttle's main engines. It takes three days to load the half-million gallons of oxidizer and propellant. "The booster tanks come alive – they moan and creak and rumble – and I can't let any outside distraction, like worrying about what's next, make me lose my focus," he says. "You

can't do this scared. I love it and I'm staying, absolutely, baby, as long as possible. It'll take a while to decommission [perhaps as long as 18 months after the last flight], and I hope to be in on that. Frankly, I don't want to do anything else." Rogers thinks NASA should throw a huge party for the thousands of people who have kept the shuttles flying all these years. "We need to celebrate in a big way all we've accomplished."

► **Bill Schmidt** leads a crew of nine electricians who maintain more than 950 lights on the East Coast's longest runway. His main tools for keeping all those lights on are a screwdriver, wrench, and voltmeter. "One thing a lot of people don't know is that when the shuttles land at night, the runway is lit up like a football field, all 15,000 feet of it," says Schmidt, 59. "The astronauts can see it from 15 miles out." The end of the shuttle era does not jeopardize his job, since the runway is used for a dozen or more takeoffs and landings each day. His employer, EG&G, recently advertised for another electrician and got more than 100 applications.

Despite the job security, Schmidt says he'll miss standing on the taxiway watching the shuttle land. "About the time you see the shuttles approach, you hear a whistling noise as the air streams over the flight surfaces," he says. "We're about 100 yards away and it is an amazing thing to see, and to know they're home safe."



▼ **Ray Trapp** has a theory: "The Chinese are going to the moon and they'll plant their flag up there and bring ours back down and put it on eBay." Trapp, 43, came to work at KSC at age 20 right out of the Marine Corps, and he has the calm demeanor you want in the guy driving the monstrous crawler-transporter, which, with the mobile launch platform and shuttle stack on it, weighs 17.5 million pounds. But his composure

wavers slightly when he mulls the thought that the United States soon will, for the foreseeable future, lose its ability to put humans in space. He's too young to simply retire, and as a heavy equipment operator, he's been trusted to move the most expensive and biggest piece of equipment on land. But he dreads the idea of searching the want ads. "Nothing," he says, "will ever be as satisfying as this."



▼ Tile technician **Charlie Romeo** laments that the job losses may well force workers into “leaving paradise.” Romeo, 50, grew up on the Space Coast and at age eight was making “what I thought were pretty technical drawings of rockets.” A soft-spoken man, Romeo says he likes inspecting, along with about 100 other United Space Alliance tile techs, the 24,000 unique tiles that protect the shuttles during reentry.

The shuttle now, he says, “is safer than ever and it is just a shame to be losing this capability.” He pauses, then adds, “There’s a lot of complex emotions going around. We spend more time together here than we do with our families, and deep relationships develop when the goal is so important. There are third generation workers at KSC losing their jobs.” Another pause. “Can we talk about this later?”





▲ Lead chute worker **James Burrell** has the mind-boggling task of untangling, cleaning, and repairing the parachutes from the booster rockets. Once the boosters are snugged up against the sides of the retrieval ships, the vessels make their way up the Banana River to moorage near the Vehicle Assembly Building, where the parachutes are unreeled. That's when Burrell, 57, and his 20-member crew take over. Imagine a surface the size of a Walmart covered in tangled, heavy, saltwater-encrusted parachutes that must be straightened, inspected for damage, washed, dried, and then repacked for the next launch. "I'm not ready for the rocking chair yet," says Burrell, who has worked on every shuttle flight and has never had a parachute failure in 31 years. He has no idea what the future holds. "We hear lots of rumors, but we're just staying focused and want to do everything correctly," he says. "There will be some decommissioning work, and a few people are self-nominating for retirement. There's nothing else I want to do."



▲ **Bob Socks**, 67, moved to Titusville in 1968 and began an entrepreneurial career that has ranged from running an Orange Julius stand to selling home decor to owning commercial buildings. He's lost count of how many shuttle launches he's seen. Socks is a member of the Titusville Chamber of Commerce and past president of the Titusville Sunrise Rotary Club. "I don't want to let negativity get the best of me, and we have

programs coming to attract high-tech industry here," he says. "But that'll take four to five years, and if you're in your early 50s and spent your career on the shuttle program, you're in trouble." Socks says he and his fellow Rotary Club members have counted 63 empty buildings on the main streets of Titusville alone. "That's just been happening the last three years, since the end came in sight."



▲ **Laurilee Thompson** has spent 27 of her 57 years catering to tourists, and her Titusville restaurant, the Dixie Crossroads, is for many Florida visitors a destination in itself. "You want real shrimp off a real shrimp boat caught that day, this is your place," she says. "We're going to feel the downturn when hundreds of thousands of people no longer show up for shuttle launches, but after the *Columbia* disaster [in February 2003] there were no launches for a couple years and we're still here." Thompson believes that periods of discontinuity offer major opportunities, and she fully expects to see the Space Coast bounce back more vital than ever once some high-tech industries discover a huge workforce ready and able to "get back at it." She grew up working shrimp boats and, as she sees it, "you just have to go out every day and expect a catch."



▲ **John Cox**, 32, an orbiter inspector, began working for United Space Alliance seven years ago. As he saw the end of the shuttle era approaching, Cox earned an aviation tech degree and is certified as an airframe-and-powerplant technician. But, he points out, there are thousands of A&P people at KSC losing jobs, and the only place they might go is the airline industry, which is faltering. "Everyone's holding tight," he says. "We want to be here for that last landing." When a shuttle lands, Cox and his col-

leagues are the first to touch and begin inspecting it. A scissors-lift truck pulls up and unloads the flight crew, and everyone lines up and shakes their hands while the inspectors wait for the brakes to cool. "That last lineup, I don't know what that'll feel like," he says, "but we'll hook up the tug and tow the ship in and see what's next." He pauses. "I've got a five-year-old son in the school we hoped for, so I'm hoping to at least be around for the decommissioning."

► **John Fischbeck**, 70, has retrieved the 150-foot-long, 12-foot-diameter solid rocket boosters on all but two shuttle missions. A master mariner, he's tall and lean with the craggy good looks of a man who spends his life at sea. About 24 hours before a launch, Fischbeck and his crew of 10 divers and assorted seamen head to a point roughly 140 miles east of Cape Canaveral and hold a position that will have them about 10 to 15 miles from where the boosters splash down. "When the rockets hit the surface, we steam for about an hour, and if it's a night launch we wait until dawn. The boosters are afloat, albeit about 100 feet of the rocket is underwater. The divers unfasten the three main parachutes and the drogue chute, and, if they're not all tangled up, we winch them in on separate reels. Sometimes they're so tangled that we have to just reel them in in one big mess." He and his crews have done the job in 15- to 20-foot seas and never lost a rocket.

Bren Wade, captain of the *Liberty Star* (one of the two sister ships that each brings back a booster) laughs a little when he describes taking the uninitiated on a booster-retrieval cruise: When the sonic



boom of the ascending shuttle hits the ship, the passengers drop their cameras and binoculars. Both Wade and Fischbeck say the eeriest thing they recall is that when *Challenger* launched in January 1986, they did not hear the boom. The *Liberty Star* has already retrieved a booster from the first Ares launch, and

Fischbeck hopes that the crews will be able to find work with Elon Musk's SpaceX program. "There's never been much turnover on this team," Fischbeck says. Wade's worry: "I don't want to end up driving a supertanker."



▲ Because **Gregory Cecil** saw the end coming, he earned a master's degree in aerospace management and, as a tile technician for United Space Alliance, took

a buyout. "It sounds like a cliché," he says, "but it was like leaving a family of ordinary people who teamed up and did something extraordinary. We had our hands on space-ships, and we learned how to make them increasingly safer and then Washington

pulled the plug." Cecil, 47, is convinced that NASA prevaricated on the shuttle program's end date for a couple years to avoid the nightmare of an exodus of workers, which might have compromised the remaining missions' safety. He had hoped to move on to the Constellation program, but that was cancelled earlier this year. Now he has grave misgivings about America's future in space. "We won't have the ability to put an American on the space station, in an American rocket, for at least a decade," he says. He doesn't hide his disappointment with President Barack Obama. "We all knew for years that the shuttle program had a sunset, but Constellation was supposed to provide human access to the space station. When Obama cancelled Constellation, he cancelled the pride that every American should have in our accomplishments." One half of one percent of the federal budget funds NASA, and they can't afford this program?"



◀ **Lisa Rice** picks an analogy from nature to explain the Space Coast's predicament. "We're in a kind of a controlled burn situation. You can't be certain of the outcome, but mostly, after the smoke clears, you've set the ground for new growth," she says. Rice, 49, is president of Brevard Workforce, a private-sector group that was formed in 2007 to deal with the end of the shuttle program. She works 60-hour weeks promoting the workforce that's about to lose thousands of jobs. "These are the highest-quality workers anywhere; their ethics, their safety practices are amazing. You could say they are in denial and that they think something will come along, as before, and save us, but most of them are staying here out of loyalty, until that last, safe landing." The White House has pledged \$15 million for retraining to help keep people afloat. In addition, the federal government will provide another \$40 million for economic development in Brevard County, and some of the money will be used to hold job fairs. "High-tech industries, and not just space-related outfits, are eyeing Brevard County as a place where an exceptional workforce exists and is eager to keep working," says Rice. The job fairs will help such industries assess the chances of establishing operations that may eventually bring more positions to the area. "The worst case is 9,000 jobs [specific to shuttle processes] going away over the next year or so," Rice says. "Best case is 7,000 [of those jobs lost], and that doesn't include all the layoffs by local government and private companies."



▲ At 79, **John Johnson** might be the most senior person at KSC. He volunteers as a tour guide and has escorted presidents and other luminaries. Johnson had been deputy commander of the cape's Patrick Air Force Base. "A lot of people don't realize that there have been more than 5,000 [launches] from the Air Force side since 1951," he says. Johnson doesn't mince words about the end of the shuttle era. "NASA's biggest mistake was not starting 20 years ago planning what would come next. Now the Russians are doubling the price of a Soyuz ride." He adds, "The other area where NASA blew it was letting the general public become indifferent towards our accomplishments. Ask 100 people how many men walked on the moon and 99 will get it wrong." He doesn't see that apathy changing in the years ahead. "I don't believe these small commercial outfits, each focused on a specific rocket, are going to accomplish much," Johnson says. "It's like going back to the Mercury days."



▲ **Travis Thompson**, a closeout technician, is confident about the future. "I'm riding this horse into the ground," he says. "Been doing closeout for 27 years, worked here for 32, and I'm ready for a break." He and his colleagues on the closeout crew are the last hands to touch the shuttle before launch. The size of his crew depends

on how many astronauts are on board the shuttle; with as many as seven in the flight crew, the closeout crew can swell to 23 people. "I've been working with some of the most amazing people on Earth," Thompson says. "This is the all-time dream job. Hell, I grew up at Vandenberg [Air Force Base, California] watching launches." ✈



LATE IN WORLD WAR II, THE BELL P-63 BECAME AN AERIAL GUNNER'S EASIEST TARGET.

JUST

BY JAMES DUNAWAY

Bundled against temperatures as low as -60° F, aerial gunners (above) struggled to protect their B-17s from German fighters. The accuracy of the gunners desperately needed to improve, and one man had an idea how to do it.

THE PROBLEM was deadly serious: In 1943, U.S. bombers in Europe were being shot down at an alarming rate. But one attempted solution provides a smile some 67 years later: an unloved American fighter stripped of its guns, painted clown-orange, and sheathed with armor that made it fly like an anvil, so that aerial gunnery students in B-17s and B-24s could shoot at it. The Bell Aircraft RP-63 Kingcobra, affectionately called the Flying Pinball Machine because of a red light on its nose that flashed when a student's bullets hit the airplane, made its greatest contribution to the war effort as a punching bag on the home front. Its pilots enjoyed the work, for the most part. Horace Ashenfelter was a newly commissioned pilot flying the Pinball in 1945 at Tyndall Army Air Field near Panama City, Florida (and later became an Olympic steeplechase champion). Says Ashenfelter, "We were playing war games, like kids!"

By the spring of 1943, the U.S. Eighth Air Force, a unit tasked with strategic air assault against Germany, had swelled to 500 heavy bombers. Losses had

swelled too. In a June raid on Kiel and Bremen, Germany, 26 bombers were shot down, 22 of them flown by inexperienced crews. In July, German fighters downed 128 U.S. bombers. U.S. gunners, meanwhile, claimed to have shot down 545 German fighters that month, a number later adjusted to 40 when planners realized that multiple guns on the same targets were producing huge errors.

On August 17, the Americans sent 146 bombers to pound the Messerschmitt factory at Regensburg, while another 230 hit the ball bearing factories at Schweinfurt. German fighters savaged the bombers, claiming 60 in a day. Into the fall of 1943, the carnage continued: September 6, Stuttgart, 45 bombers lost; October 8, Bremen, 30 lost and 26 badly damaged; October 9, above several targets in Germany and Poland, 26 lost; October 10, Muenster, 30 lost; and over Schweinfurt's ball bearing plants again on October 14, now called Black Thursday, 60 bombers down. The result: U.S. commanders halted deep penetrations into Germany until the arrival of the P-51 Mustang escort, with its extended range.

Long before the Eighth Air Force took these



NASM (SI NEG. #A-3015-P)

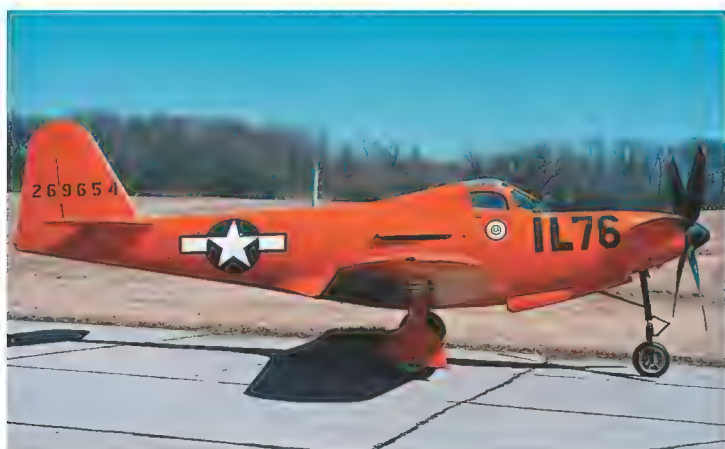
SHOOT ME

losses, Cameron Fairchild, an Army Air Forces major, wanted to improve the results of the guys in the gun turrets. A trainer at Harlingen Army Air Field in Texas in the spring of 1942, Fairchild intended to improve on such practice techniques as firing shotguns at clay pigeons, shooting .30- and .50-caliber machine guns on the ground at targets on wheels, simulating air combat on a movie screen, and shooting at target banners towed by B-17s, B-34s, or AT-6s. Fairchild wondered if a bullet that splintered harmlessly on impact could be developed to fire at real pursuit airplanes.

It took the better part of a year for researchers at Duke University and the University of Michigan, as well as engineers at the Bakelite Corporation, an early maker of plastics, to come up with a plastic-metal casing for the bullet. By late 1943, the team delivered a frangible—breakable—bullet that would not jam a .30-caliber machine gun, would fly like a real bullet, and would shatter on impact. Powdered lead manufactured by DuPont gave the bullets the proper weight and density.

Some in the Army called Fairchild a “lesser Billy Mitchell” for his willingness to risk rebuke in the zealous pursuit of his ideas. Promoting the frangible bullet, he defied the usual path of Army ordnance development by first working with academics Paul Gross and Marcus Hobbs at Duke. The Army Ordnance Department then argued that a bullet made of frangible material would have different ballistics from a real one, wouldn’t fire properly, and could be safely fired only at a target airplane that had been heavily armored. The National Defense Research Committee approved the idea, but with limited funding and urgency, which slowed its progress.

A P-39Q Airacobra (above, at left) keeps pace with its slightly improved offspring, a P-63 Kingcobra (note different tails). Armor, orange paint, and a red nose light turned the latter into the Flying Pinball (left).



The P-39 and P-63 saw action mainly with the Soviets, who received several thousand of them via the Lend-Lease Act. Below: One P-39 made it back to Las Vegas in 1986 to attend the U.S. Air Force's Gathering of Eagles.

In Fairchild's favor, reports through 1943 and 1944 showed that gunners in Europe needed better training. Fairchild turned his attention to a target airplane. In the first half of 1944, a flirtation with the twin-engine, combat-proven Douglas A-20 gave way to Bell's single-engine P-63, which the Army deemed more like a Messerschmitt Bf 109. Like its P-39 ancestor, the P-63 had been ignored by the Army in favor of the P-51 and the P-47 Thunderbolt. And like the P-39, the P-63 was exported through the Lend-Lease Act to the Soviet Union and France.

The Pinball was given modified cockpit glass that was more than an inch thick, and its wings and forward surfaces were heavily armored with a special aluminum alloy. Beneath the armor, sensors registered hits, which were displayed on a counter in the cockpit. In the nose, the 37-mm cannon was replaced by a light that flashed red with every hit.

Beginning in early 1945 at air bases in Florida, Texas, Arizona, and Nevada, Pinball pilots began to take off and rendezvous with B-17s and B-24s. From the skies over the Florida Everglades, the Gulf of

were making high side passes, and about the last couple of hundred yards the instructors would make us stop firing. Then the guy would break down under the ship, come up on the other side, go up on the perch, and make another pass. When they'd finish a pass, they'd call the ship and say, 'You got six hits, or ten, or three.'

"We would normally fly two or three missions a day," says Ashenfelter. "The missions would last about an hour and a half. The RPs would hold gas for about two hours' worth, but by the time you got up there and did your thing with each airplane you had to attack, you'd be out of gas."

The Pinball pilots were a mixed lot. Some were newly minted 19- or 20-year-old second lieutenants on their first assignments. Others were veterans of combat missions with fighter groups in England and Italy. After flying frontline fighters, adjusting to the RP-63 was not a problem for veterans, but deliberately letting themselves be shot at took some getting used to. "We'd get pilots with combat experience in Europe," says Corson, "and they'd come to our base after a month or two of R&R. The first time around in an RP-63, the first mission, they were definitely twitchy. They'd been shot at, after all, and then going up and doing it on purpose was something they didn't really like. But they'd all come down after that first mission with big grins on their faces."

John Aranyos had flown 82 combat missions in the P-47 and been shot at plenty of times by Germans, but wasn't sure about being fired on by Americans. "I'll tell you what," he says, "I was a little apprehensive. I got to my altitude and made my first pass at the bomber, a B-17. He was at 9,000 feet and I was several thousand feet higher. And I thought to myself that I was deliberately setting myself up as a perfect target for some eagle-eyed kid aspiring to be a top-notch gunner at my expense. I felt I was the world's greatest idiot."

"As I made the first pass, I was expecting to feel the impact of the frangible bullets—and there was no impact! I couldn't believe it. I thought they were dry firing at me or something. And the recorder showed I had been hit 14 times. That is when I started being able to feel confident that the airplane was going to give me a good ride."

Though the RP-63's Allison V-1710-177 liquid-cooled engine generated up to 1,800 horsepower, the armor made the aircraft challenging to fly. Still, Ashenfelter liked the extra weight. "It was not as maneuverable as the regular P-63, but it was smoother," he says. "On the downside, you could get a little bit of a high-speed stall if you maneuvered it too abruptly, and then you had a real problem."

Barrie Davis, flying Pinballs at Las Vegas after a 70-mission tour in Italy in the P-47 and P-51, found that out the hard way. "I made the mistake of trying a



Mexico, and huge swaths of western desert, countless shell casings and spent bullets began to fall. In each bomber's waist were 12 student gunners with 2,000 rounds each, taking turns as the RP-63 swooped down from above in an attack pattern.

"We'd fly curves of pursuit, like fighters did in battle," says Henry "Hank" Rodrique, then a 19-year-old second lieutenant flying Pinballs at Harlingen, Texas. "Sometimes when I'd break off, they'd still shoot."

Robert Corson, a crew chief at Yuma Army Airfield in Arizona, says, "The Pinballs would come in with holes in the empennage, because the gunners would freeze on the trigger and keep on firing when the Pinballs pulled up at the end of a run, and the rudder and horizontal stabilizers were vulnerable. We'd just patch the holes with small squares of cloth and glue them on, and go on our way."

One gunner, Harry J. Byer, recalls, "The RP-63s





loop one day,” he says. “I dived to pick up airspeed, and I went up and over the top in good shape. But coming out of the loop, every time I’d put a little back-step pressure on the thing, I’d hit a high-speed stall. So it was just a question of which was going to happen first: Was I going to stall into the ground, or was I going to fly that machine out of the loop? Well, I made it out of the other side, but I was below the mountains.”

According to Merlyn Franck, who flew Pinballs out of Laredo, Texas, “The whole secret was to keep your airspeed up and a little power on at touchdown. One of our pilots neglected this advice and allowed his RP-63 to get too slow on final approach. He dropped it in so hard it drove both main gear struts up through the wings.”

The RP-63’s real Achilles’ heel involved wing root ducts that fed air to the engine’s cooling system. When a bullet found the duct, its fragments would puncture parts of the system. As the engine overheated, the pilot had to choose a bailout or a deadstick landing. The latter happened plenty of times on the dry lakes of Nevada. After taking a round in the air duct, Captain Ingvar Jacobsen found a lake bed before his engine quit. On another mission, the pilot of a bomber Jacobsen was working with was having engine trouble. When Jacobsen flew closer to inspect, the waist gunner opened up on him. At such a short range, the frangible bullets were as deadly as real bullets, and they shot out his engine. Jacobsen bailed out.

There were variations in the performances of the RP-63s, especially in the hit-counting system. Vibra-

tions from the flight of the airplane itself could set off phantom hits. On other occasions, the counters failed to work. “Back on the ground,” says Davis, “we’d take a grease pencil and go over the whole plane and mark all the new hits.” The ones from previous missions had been circled; the new ones appeared as dust spots.

Through most of 1945, the Pinball program gave gunnery students their only realistic practice at aerial combat. In all, some 300 P-63s were converted into Pinballs, but the war’s end made them obsolete. A few continued to train B-29 gunners after the Japanese surrender, but by the end of 1947, all the Air Force’s RP-63s had been mothballed. When centralized gunnery control was developed for the B-29 and introduced in the spring of 1944, automated shooting took over. In the first version of the B-52, a gunner was located in the tail, but in later versions, he was moved to the cockpit, where he operated the guns remotely. In the decades since, Pinballs were replaced by target drones. In fighters, heat-seeking missiles replaced machine guns, and some bombing missions are now flown by unmanned vehicles directed by armchair pilots thousands of miles away.

In his book *Operation Pinball*, Pinball pilot Ivan Hickman recounted, “Most of the pilots I knew felt that the [P]inball program, despite its shortcomings and inherent dangers, was the training device of the future.” Those pilots weren’t totally wrong. But the future they spoke of turned out to be one measured in months. And, as Horace Ashenfelter noted, “It was fun.” —

Pinballs get revved and ready to be shot down – sometimes for real when a frangible bullet found its way into the cooling duct at the wing root. War’s end and new technologies sent the Pinball to the ground for good.



THE MISSILE THAT HAS RATTLED ENEMY PILOTS SINCE 1958.

SIDEWINDER

MAY 1956. Holloman Air Force Base, Alamogordo, New Mexico. The preflight briefing took place in the office of the base's commanding general, but the center of attention was a cocky young Navy pilot named Glenn Tierney. He was dead certain that he was about to win a shoot-off between two weapons competing to become the United States' first self-guided air-to-air missile. The Air Force was betting on the radar-guided Falcon, built by a vast engineering group at Hughes Aircraft. Representing the Navy, Tierney was betting on the heat-seeking Sidewinder, developed by a small cadre at the Naval Ordnance Test Station in China Lake, California.



Tierney, the commander of Guided Missile Unit 61, had already demonstrated the lethality of the Sidewinder, blowing up a surface-to-surface Matador missile a few hours earlier. Now, he told his skeptical audience, he planned to fly as a wingman while an Air Force pilot who had never before fired a Sidewinder destroyed a second Matador. When the general scoffed, Tierney told him, "I'll cover all the bets in the room up to \$100."



BY PRESTON LERNER

WINDER

For more than 50 years, Sidewinder missiles have been riding the rails of U.S. Navy fighters, from F9F-8 Cougars (left) to F-14 Tomcats (above).

After \$85 was collected, Tierney and an Air Force lieutenant took off in a pair of F-100 Super Sabres. At 30,000 feet and Mach 0.8, they lined up two miles behind a Matador already in the air. “You got signal?” he radioed to the other pilot.

“I got good signal,” said the pilot, referring to the distinctive growl in his headset, which meant that the heat-seeker in the nose of his Sidewinder had locked onto the infrared radiation of the Matador’s exhaust.

“Well, let her go,” said Tierney.

“It was a turkey shoot—nothing to it,” Tierney recalls with a chuckle. “The

Sidewinder blew that son of a bitch right out of the sky.” Tierney flew back to China Lake with \$85 of Air Force money in his wallet.

Despite the Sidewinder’s success at Holoman, the Air Force chose to put its own missile, the Falcon, into service in 1956. The missile was so finicky that in Vietnam, it became synonymous with failure. The Sidewinder, on the other hand, which entered service in the Navy a few months after the Falcon, scored the world’s first guided-missile kill: a Chinese MiG-17 that a Taiwanese F-86 shot down in 1958. Since then, the Sidewinder, later designated the AIM-9 (for Air Intercept Missile), has claimed dozens of victims in Vietnam, several Arab-Israeli conflicts, the Falkland Islands War, and Operation Desert Storm.

The missile has been built by the hundred

thousands not only in the United States but also under license in several NATO countries. Working with stolen plans, the Soviets copied it so faithfully that the Vympel K-13 shared the Sidewinder’s parts numbers. The Soviet missile was exported en masse to Warsaw Pact countries and later copied by the Chinese. But new-and-improved ‘Winders continue to be assembled by Raytheon in Tucson, Arizona, and the missile has progressed through the alphabet from the AIM-9A to today’s AIM-9X.

Even after all these years, the latest Sidewinder variant still retains the five-inch diameter and rough dimensions of the cigar-shaped original. It’s gotten longer (from just over 109 to 119 inches) and leaner, from 155 pounds to 118 pounds. But like George Washington’s hatchet

TOP: GEORGE HALL/CHECK-6.COM; OPPOSITE LEFT: US NAVY

(“Only the handle and the blade have been replaced”), the Sidewinder has been modified so thoroughly over the past half-century that just about all that remains of the original is the name. Well, that and the fundamental concept, which dates back to 1947, when an engineering genius named Bill McLean made a rough sketch of what he called a “target-seeking gyro.” A few years later, he filed a patent application for a “heat homing rocket.” By the time McLean and his merry band of missileers at China Lake were finished, the Sidewinder had earned a spot on the short list of weapons that have changed the way battles are fought.

After World War II, the Naval Ordnance Test Station at China Lake (now the Naval Air Warfare Center Weapons Division) was the Promised Land for weapons development and testing. Situated in the

The most promising guidance system seemed to be radar, which was, after all, a proven technology. But because the equipment was too bulky to fit inside a rocket, the airplane firing the missile had to “paint” the target with radar, and the pilots had to stay locked on until the warhead detonated.

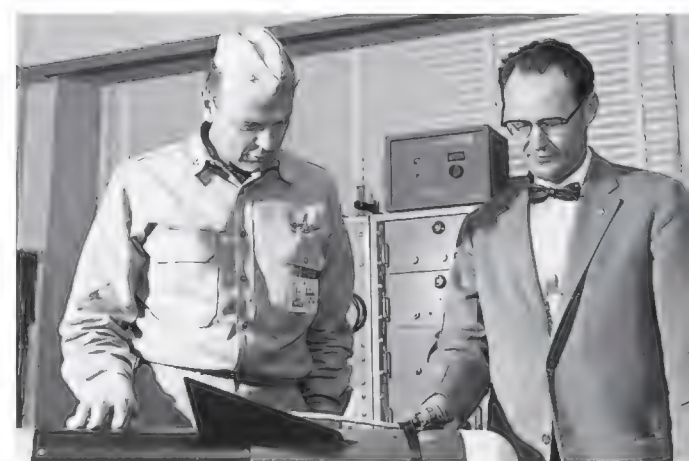
McLean had a better idea: Why not create a weapon that carried its own control system, so the missile was guided by the target? This led him to investigate the use of an infrared seeker to detect the target’s heat. McLean wanted to give a conventional rocket—a dumb weapon—eyes and a brain. The missile would “see” via a transparent seeker head, through which infrared radiation from the exhaust of a jet engine would reflect off a gimbaled, rotating mirror onto a lead-sulfide photocell. As the gyroscopically stabilized mirror

it was a passive weapon that gave the targeted pilot no warning until he saw the missile flying toward him. Small, lethal, and able to strike quickly and outmaneuver its quarry, it shared several qualities with another heat-seeking predator native to the Mojave Desert: the sidewinder rattlesnake. So in 1950, another proposed name—Low I.Q. Homing Head—was rejected, and Sidewinder was adopted.

There was no official backing for the project, and on several occasions it was nearly canceled. But the tiny team working on the Sidewinder was persistent as well as ingenious, and the engineers, faced with seemingly intractable problems, developed a host of elegant solutions. A good example was the so-called rollerons: spur-like discs that unlocked from the tail fins in flight. The gyroscopic effect of the spinning discs prevented the missile



US NAVY (2)



Mojave Desert three hours northeast of Los Angeles, it featured 1,200 square miles of largely unpopulated terrain that was perfect for blowing things up. Its remote location also fostered a self-reliant spirit and contrarian mentality that attracted unconventional thinkers. McLean, a graduate of the California Institute of Technology whose genial and unassuming demeanor hid a mighty intellect (later Sidewinder program manager Frank Cartwright describes him as “a 108 on a scale of 100”), arrived in 1945 to work on air-to-air rockets.

Rockets serve a lot of useful functions, but shooting down airplanes isn’t one of them, a truth demonstrated all too clearly in 1956, when a pair of F-89 Scorpions fired 208 rockets against a wayward drone that was threatening southern California, and failed to score a single hit. After World War II, various military contractors developed nearly a dozen guided missiles.

The Naval Ordnance Test Station at China Lake, California, had a 4.1-mile concrete runway for supersonic test runs. In 1950, a sled-mounted Sidewinder prototype ate up the track (above). William B. McLean (with glasses) was the engineering genius behind the missile’s design; his work was overseen by station commander Captain Frederick L. Ashworth.

moved to track the heat source, a servo motor manipulated the canards that controlled the missile’s flight, maintaining a constant bearing with respect to the target. Proportional navigation, as the technique is called, enabled the missile to anticipate where the target was going to be rather than aiming at where it was, like a quarterback leading a receiver.

Compared with radar-guided missiles, McLean’s alternative was cheap, simple, and robust. Also, unlike radar guidance,



US NAVY/CHINA LAKE ARCHIVES (3)

from rotating on its axis. And then there was the famous Sidewinder tone, a menacing growl—once heard, it is never forgotten. During early flights, test pilots had to check a small voltmeter in the cockpit to determine whether the seeker was sensing a heat source, an unwanted distraction in the middle of a dogfight. By running an additional wire to the missile, the Sidewinder team was able to create a sound that could be piped into pilots’ headsets to alert them that the



Fully loaded with two external fuel tanks, a blue instrumentation pod, a Sidewinder (second from top), an AGM-88 high-speed anti-radiation missile (in white), and an AIM-120 (bottom), a U.S. Air Force F-16C banks over a desert test range (above). A Navy F9F-8 (opposite) launches a Sidewinder that scores a direct hit on the wingtip flare of an unmanned Grumman F6F Hellcat.

seeker had acquired a target.

Tom Amlie worked on the Sidewinder project as a young Navy lieutenant, and he later became technical director at China Lake. He says the secret of the missile's success is simplicity: "In flight, it had seven vacuum tubes and five moving parts. The competition [Falcon] was complicated almost beyond description." For professor Ron Westrum, the author of *Sidewinder: Creative Missile Development at China Lake*, the project demonstrated

the triumph of lean R&D and imaginative management. "They had less than 25 people in the beginning, and they did it as a bootleg project," he says. "The Sidewinder demonstrated that what we now call a skunk works actually works."

Well, not at first.

Several years of development passed before the missile was ready to be fired in a simulated combat environment. In August 1952, astronaut-to-be Wally Schirra, flying an AD-4 Skyraider, launched a heat-

seeker toward a propeller-driven Grumman F6F Hellcat that had been turned into a radio-controlled drone. Final score: Hellcat 1, Sidewinder 0. In fact, all 12 of the first Sidewinders missed the target. On several tests, Amlie flew in the right seat of the attack aircraft. After one failure, he wrote a memo quoted by Elizabeth Babcock in her history of China Lake, *Magnificent Mavericks*: "Missile took off like a big-assed bird, never saw it again."

The 13th test, on September 11, 1953,

TOP: USAF/TSG MICHAEL AMMONS



Share this article online at as.hy.pr/sidewinder

was the charm. The Sidewinder fired by Lieutenant Commander Al Yesensky missed the drone by two feet, but if the missile had been equipped with a warhead and a proximity fuse, it would have destroyed the Hellcat, so the shot was declared a success. Four months later, an unarmed Sidewinder scored its first direct hit, punching a hole through the number 1 engine of a QB-17 drone. Then, on February 17, 1954, the Sidewinder did the unthinkable: It brought down—in cartwheeling flames—another QB-17 thought to be indestructible because it had survived so many missile attacks over the years.

The Sidewinder had shown its fangs.

CONVENTIONAL MILITARY WISDOM circa 1967 held that close-in dogfights were a relic of the past. Radar-guided AIM-7 Sparrows, developed by Sperry Gyroscope and Douglas Aircraft and first deployed in 1958, were supposed to take out bogeys while they were still miles away, and if that didn't work, AIM-9 Sidewinders would finish the job long before enemy pilots got close enough to fire cannon. Thus, the F-4B Phantom wasn't even equipped with a gun. Which meant that Navy Lieutenant Denny Wisely couldn't do anything other than give his North Vietnamese adversary the finger as they passed canopy to canopy in the airspace near Hanoi.

The date was April 24, 1967, and Wisely

was embroiled in an epic furball: three F-4s against eight or nine MiG-17s. Twice, he was in position to fire the gun he didn't have. Compounding the problem, his Phantom had been loaded with only one Sidewinder instead of the usual four (a fast turnaround of the aircraft between missions didn't leave enough time for ground crews to install the full ordnance load). He was carrying four Sparrows, but he figured he was too close to the nimble MiGs to use the long-range missiles.

"We're not going to get radar lock in this environment," Wisely recalls radioing his backseater, Lieutenant (junior grade) Gary Anderson. "I'll just keep pulling the airplane up, using the afterburner as necessary, then unloading it and turning so you can reach around in your seat and really check our six."

Zooming up and down between the treetops and 5,000 feet, Wisely waited for

the right shot for his single Sidewinder. Twice, he saw Sparrows punched off by other Phantoms fly harmlessly into the distance. Then he spotted a MiG sidling in behind an F-4. Wisely rushed in behind it, heard his Sidewinder growling, and fired. Another North Vietnamese pilot must have alerted Wisely's prey. But as the MiG banked right to escape the missile, the 'Winder struck and exploded.

"It was just 'Thank you very much, MiG,'" Wisely says today.

Wisely's experience notwithstanding, guided missiles performed much worse in Vietnam than expected. Sparrow hit rates through 1968 were so anemic—eight percent—that most pilots fired them in pairs, figuring at least one would be a dud. With a hit rate of 16 percent, the Sidewinder was twice as good but not nearly good enough. Actually, the Navy version of the Sidewinder, the AIM-9D,

Towering over China Lake commander Ashworth (below, left), the Sidewinder was Navy-born-and-bred, but it has become a mainstay for other branches of the military. Two F-16s assigned to the U.S. Air Force Fighter Weapons School sport Sidewinders during a training exercise near Nellis Air Force Base in Nevada (below).



RAYTHEON (2)

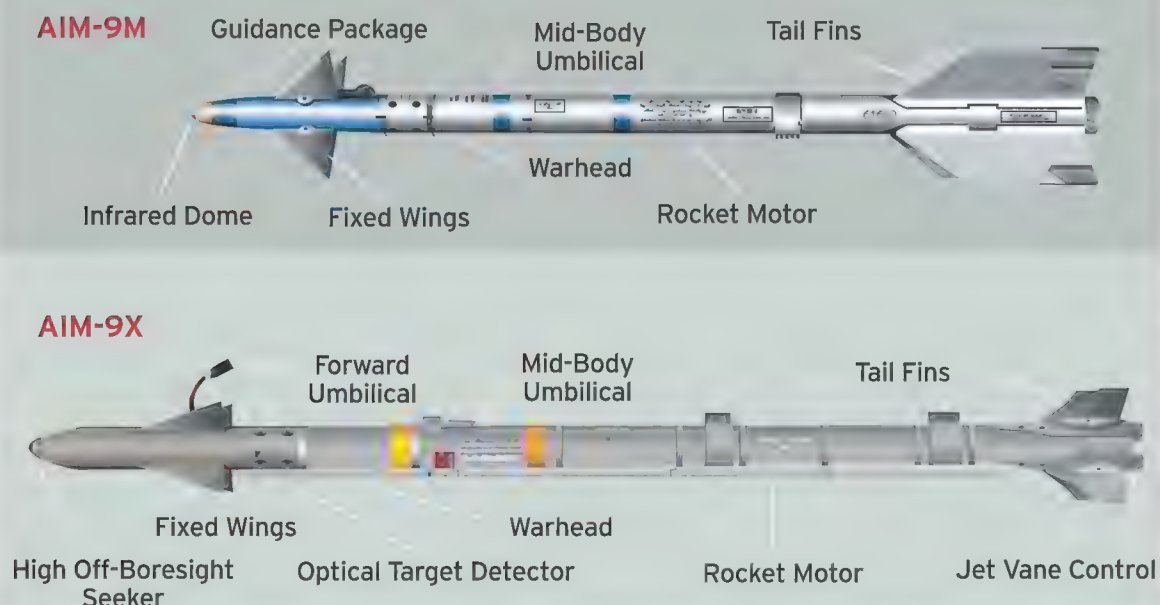


LEFT: US NAVY; RIGHT: USAF/ TECH SGT BILL THOMPSON



Improved Sight for the Sidewinder

The fourth generation AIM-9M is an analog missile: To reprogram it, a technician must replace the guidance hardware. The all-digital fifth generation AIM-9X, on the other hand, can be reprogrammed simply by changing its software. The -9X also has very high off-boresight capability: The missile's infrared seeker has more "peripheral vision" than that of its predecessor.



BILLY SMALLWOOD/AIR FORCE NEWS AGENCY (2)



Opposite: Technicians finish assembling AIM-9X missiles at Raytheon's production facility in Tucson, Arizona. Left: A worker examines the -9X's infrared seeker. The most recent version of the Sidewinder, the AIM-9X is in service with more than 40 nations.

had a nitrogen-cooled seeker head that improved its ability to track infrared radiation, enabling it to outperform the Sidewinders used by the Air Force. Nevertheless, the Navy was so upset that it commissioned a hard-driving captain named Frank Ault to figure out what was wrong.

After several months of study, Ault produced a 480-page Air-to-Air Missile System Capability Review. Popularly known as the Ault Report, it began by assessing what happened when 600 air-to-air missiles were fired in 360 Navy and Air Force combat engagements between 1965 and 1968. "Only about one in ten had any probability of achieving a kill," the report stated. To hit its target, the Sidewinder had to be launched within a strictly defined envelope, no more than roughly 30 degrees off the tail of the adversary and at relatively modest G loading. Among his 242 recommendations, Ault suggested that the Navy create a school for post-graduate air-to-air combat training. In 1969, the Navy Fighter Weapons School, a.k.a. Top-

gun, was established at then Naval Air Station Miramar in California.

"Most dogfighting maneuvers, from World War I to Vietnam, were designed to put a fighter in a gun's firing envelope," says Robert Shaw, an author and air combat consultant who used to fly a gunless Navy F-4. "But with the Sidewinder, once you got into gun range, you were too close to fire." Since airplanes were so much farther apart, turning with the enemy made no sense, so counterintuitive tactics—flying vertically when the target turned horizontally, for example—were developed. Also, the conventional fighting, or welded wing, in which the leader hunts for targets while his wingman protects his rear, didn't work in the missile environment. Instead, Shaw explains, aircraft moved farther apart and flew line abreast so that each could watch the other's tail.

As tactics improved, so did the Sidewinder. Over the years, it underwent a series of upgrades—better seekers, more efficient fuses, stouter rocket motors, slicker aerodynamics—to expand the firing envelope and make the missile less susceptible to countermeasures. The AIM-9L added all-aspect capability—it could hit an airplane no matter what its relative angle, even approaching head on. This so-called Super Sidewinder was so deadly that in dogfights over Lebanon and during the 1982 Falkland Islands War, it posted kill ratios of better than 80 percent. And in the next decade the follow-on, AIM-9M, was even more efficient in dogfights over Iraq and Bosnia.

But by the mid-1990s, the Sidewinder seemed on the verge of being replaced by newer heat-seeking missiles with more bells and whistles. Instead, a digital makeover gave engineers the chance to "teach an old dog new tricks," as Dave S. Adams, director of Raytheon's short-range-missile programs, puts it. In the fifth generation AIM-9X, the analog seeker and its mechanically rotating mirror—what Adams calls a "chirps and squeaks system"—were replaced with a staring focal plane array, the pixel-based technology in a digital camera. Besides being able to track infrared energy more efficiently and see targets more accurately through its nose cone, the latest AIM-9X is also far better at distinguishing between targets



and countermeasures, such as flares.

At the tail end of the missile, designers added movable jet vanes to redirect the exhaust plume of the motor and achieve a form of thrust vectoring. This allows the -9X to turn at much sharper angles after coming off the launch rail than previous models, which is a major advantage in close-in aerial combat—the proverbial

five miles, Dietz started to make out the details of one bogey: Canopy. Sloped tail. Swept wings. Suddenly, his radio crackled: “VID Fitter.” Hehemann was visually identifying the Iraqi aircraft as a Sukhoi Su-22 fighter-bomber (“Fitter” is the Su-22’s NATO name). They would later learn that it was returning from a mission to bomb Kurdish civilians. Dietz, closing

the missile, got a good tone, and fired.

“I didn’t want to fly out in front of the Fitter,” Dietz recalls. “So I pulled up as soon as I saw the missile come off the rail. When I rolled back over and looked down, all I saw was a fireball. The AIM-9 went right up this guy’s tailpipe, and his airplane blew up just like the movies. There was not a discernible piece left, just a bunch of metal in a huge fireball.”

Since Desert Storm ended, the world has changed radically, and nobody knows what the combat environment will look like if and when airplanes trade ordnance again. In the future, some military thinkers suggest, aerial engagements may feature more unmanned vehicles than conventional fighters, and the diminishment of

During Desert Storm, most fighters packed Sidewinders: A Navy A-7E Corsair (left) heads to a target with a load of 500-pound bombs and a Sidewinder mounted near the fuselage; F-16s armed with the missiles (opposite) await the next mission. Though long-range AIM-7 Sparrows shot down at least 25 Iraqi aircraft, Sidewinders earned eight kills.

knife fight in a phone booth. And by using thrust vectoring to help control the missile, designers could reduce the size of the Sidewinder’s conventional control surfaces—canards and tail fins—and clean up the missile’s aerodynamic profile. So despite using the same solid-fuel rocket motor as the -9M, the -9X flies significantly faster and farther.

MARCH 1991. The war with Iraq was over, but the cease-fire was still in place, and Captain Tom Dietz and his wingman, Lieutenant Bob Hehemann, were patrolling the skies 50 miles north of Baghdad in their Air Force F-15 Eagles. During the fighting, they’d used Sidewinders to down four Iraqi jets making a run for the Iranian border. But according to the rules of engagement in force since the cease-fire, the Iraqis were allowed to fly helicopters. So when Dietz locked up a pair of targets on his radar scope, he assumed that’s what they were—until he realized that they seemed to be flying at 345 mph. “Let’s go investigate this,” he radioed Hehemann.

They pushed their throttles forward to military power. At a range of about



TOP: US NAVY/CDMR LEENHOUTS; RIGHT: USAF/TECH SGT JEFFREY ALLEN

quickly, immediately activated the master switch, which cooled the seeker head of his Sidewinder by flooding it with argon gas. A second or two later, he uncaged

the human factor could change the calculus of weapon design. At the same time, history has taught us that each advance in military technology expands the weapon-engage-



TOP: USAF/TSGT FERNANDO SERNA; LEFT: US NAVY/PHI PAUL SOUTAR

Opposite: During a training exercise, an F-16 Fighting Falcon assigned to the 80th Fighter Squadron at Kunsan Air Base in South Korea unleashes a Sidewinder. The missiles can reach speeds up to Mach 2.5.

Ordnance crews move four AIM-9Ls across the flight deck of the aircraft carrier USS Midway. In service since 1978, the -9L was the first variant that could attack from all angles.

ment zone, from ancient swords with a range of only a few feet to beyond-visual-range missiles that can destroy targets seen only on radar screens.

Under the circumstances, says Dik Daso, a former Air Force F-15 pilot who is now the National Air and Space Museum's curator for modern military aircraft, the role of the Sidewinder is bound to shrink. "These days," he explains, "the object is to deploy your radar missiles so that when you get to the merge [the point at which two fighters pass each other], hopefully you see nothing but fireballs. But in air-to-air combat, nothing ever goes perfectly, and I think the AIM-9 is the best fallback for self-defense that you can have." Says Captain Jeffrey Penfield, a former F/A-18 pilot who, until recently, ran the

Navy's Air-to-Air Missile Program Office: "When you get in a mano-a-mano, visual-versus-visual engagement, the AIM-9 is the weapon of choice."

Military procurement officials apparently agree. Since 2001, more than 4,000 AIM-9Xs have been built, and the missiles have been sold to 10 countries, bringing the total production to more than 200,000 Sidewinders flown by 51 nations during the past half-century. An upgraded Block II version is poised to start coming off the assembly line in Tucson (in the cavernous plant that Howard Hughes erected to build the Sidewinder's original rival, the Falcon). Current plans call for production to continue into the 2020s. It should come as no surprise that there's talk of certifying the AIM-9X for the next-gen F-22 and F-35 fighters. In fact, unless some new technology (lasers? directed-energy projectiles? space-time-continuum shredders?) renders heat-seeking missiles obsolete, AIM-9s will likely still be in military inventories a century after the first successful launch at China Lake.

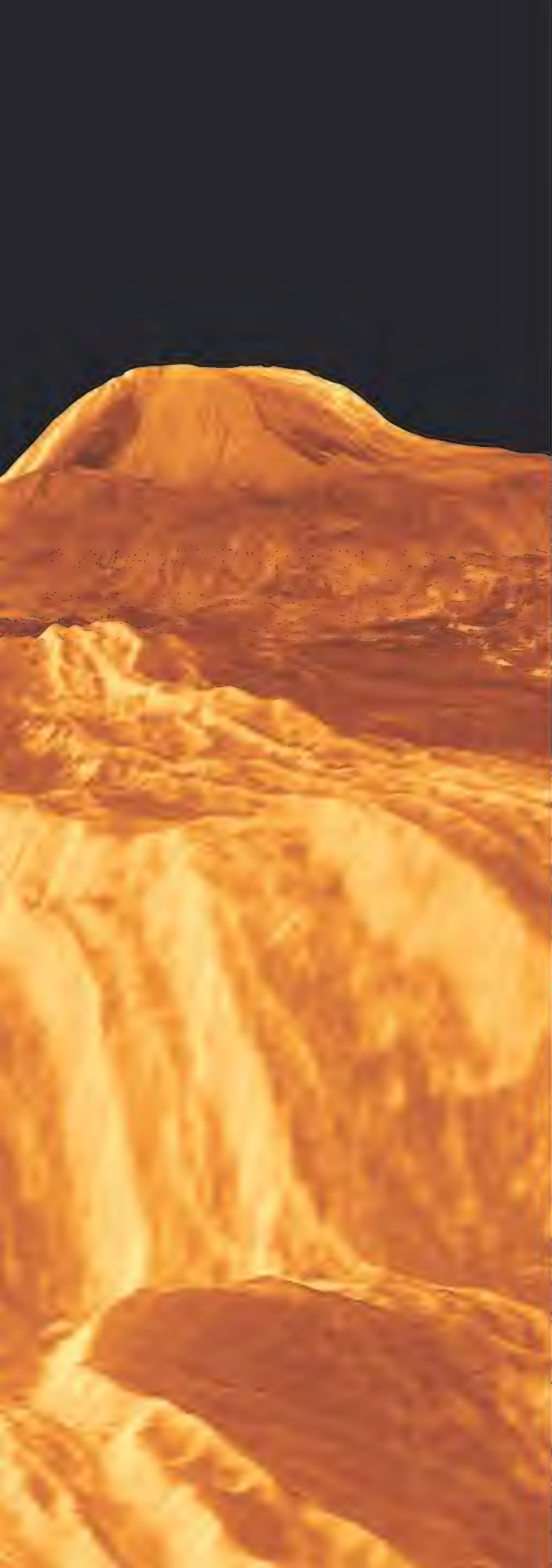
This time around, nobody's betting against the Sidewinder. ➤

WE'VE BEEN TO THE MOON. MARS IS EASY.

BUT LANDING ON VENUS? THAT'S TOUGH.

FORBIDDEN PLANET





OVER THE PAST 15 YEARS, astronomers have identified about 500 planets around distant stars, and are now closing in on the ultimate prize: finding a world similar to our own, with conditions right for life. Such a discovery would be a technological triumph and a historic scientific achievement.

But we should never have had to look so far.

Venus—the planet closest to us, and our twin in terms of size and mass—should by rights have developed in parallel to Earth. Instead it became a monstrosity, the relative we hardly mention and rarely visit. In the planet's dense atmosphere, carbon dioxide, a greenhouse gas, somehow built up to toxic levels, now accounting for 96.5 percent of Venus' air, as compared to 0.04 percent of Earth's. The runaway greenhouse effect made Venus hotter than a self-cleaning oven, with atmospheric pressures equivalent to those found half a mile under Earth's oceans. Says space physicist Larry Esposito of the University of Colorado at Boulder, "Dante's vision of hell is real, and it is the planet next door."

Maybe that's why he likes studying it. Esposito began his space science career with NASA's Pioneer Venus missions in 1978, and in 1995 he was the first to observe the planet with the Hubble Space Telescope. Landing on Venus has proven a more elusive goal, though. No one has sent a probe to the surface in 25 years, and NASA has never even tried. Since the Magellan orbiter mapped Venus with radar in the early 1990s, the U.S. space agency has focused its attention primarily on Mars and the outer planets.

Meanwhile, Esposito has pitched Venus mission proposals to NASA and the space agencies in Europe, Russia, and Japan, with mixed success. His curiosity about the planet—"particularly the comparison between Venus, Earth, and Earth-like planets"—drove him on, he says, and he never lost interest. "I've been busily working on [concepts] for 30-some years. I've always had a plan for a future mission to Venus. Every year it changes."

Esposito's time may finally have arrived. As greenhouse gases like CO₂ build up in Earth's atmosphere, scientific priorities are shifting, and closer attention is being given to proposals to study a neighboring planet that may be an object lesson for Earth. Last December, NASA gave Esposito \$3.3 million to further develop

Most pictures of the Venus surface are synthetic, like this view of a volcanic region called Eistla, created from Magellan orbital radar data. The SAGE lander would take actual photos from ground level.

his Surface and Atmosphere Geochemical Explorer (SAGE) concept, which would place a small probe equipped with cameras, spectrometers, and other instruments on the Venusian surface. If NASA decides to fund SAGE (next year the

BY SAM KEAN

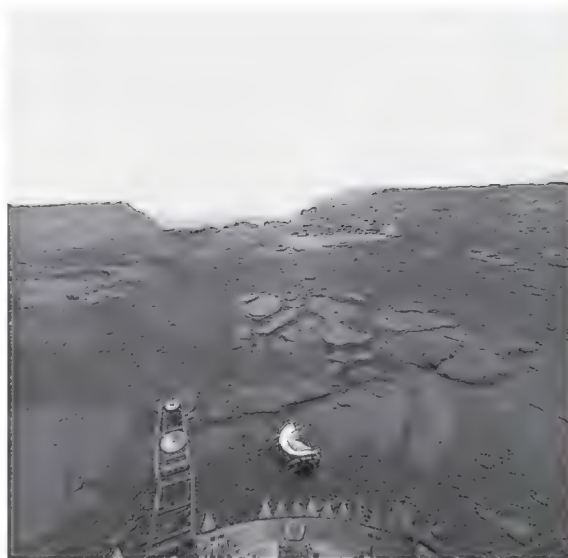
NASA/JPL

agency will choose between it and two other proposed missions: one to an asteroid, the other to the moon), then a spacecraft could return to Venus by 2018, becoming the first to visit there since the Soviet Union's Vega 2 in 1985.

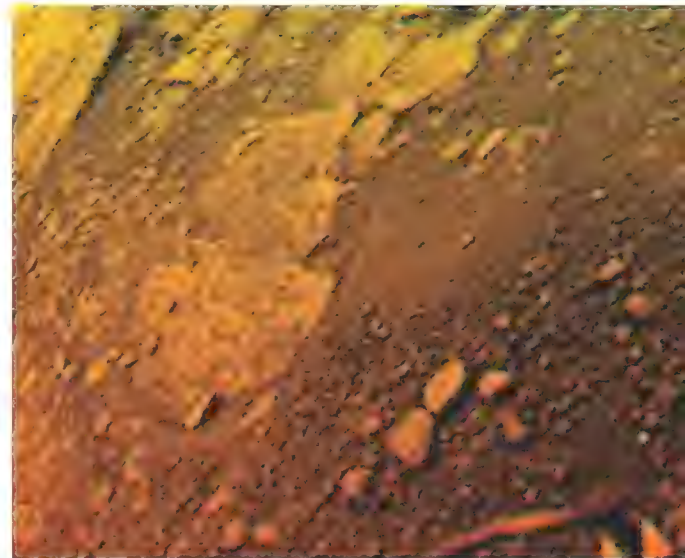
In the 1970s and 1980s, the Soviets practically tried to colonize Venus, sending more than a dozen landers and orbiters. One, Venera 13, which landed on March 1, 1982, lasted 127 minutes before expiring. At the height of the program, tens of thousands of people were working on the Veneras, according to Viktor Kerzhanovich, a Venera veteran and now a planetary scientist at NASA's Jet Propulsion Laboratory in Pasadena, California. In true cold war style, he says, the Soviet Union added as many zeroes to the Venera budget as were necessary to beat the Americans.

Given their prior successes, it's not surprising that Russians like Kerzhanovich are eager to go back to Venus: "When the opportunity comes, I hope to be part of an American mission," he says.

THERE'S A COMMON PERCEPTION that the Soviet Venus probes were crushed by the sheer weight of the planet's atmosphere. That's (mostly) false. But the truth's not much better. Venus is the most inhospitable world in the inner solar system, boiling hot and rife with airborne acids. Developing the technologies to withstand those conditions—even for one afternoon—will take years and cost hundreds of millions of dollars. From the first brush with Venus' atmosphere, the lander will be fighting thermodynamics, and it will lose.



COURTESY DON MITCHELL (2)



The proposed SAGE lander would look, from the outside, like a giant ball bearing. But it will behave more like an insect, one of those poor bugs that lies dormant for decades, then claws out of its cocoon, sticks out arms and antennae in a frenzy of activity—and croaks. At least cicadas get weeks to romp. A Venus lander gets hours.

The dangers start more than 80 miles above the planet's surface, after the lander is dropped off by a carrier spacecraft, and get worse as the lander descends through the atmosphere. The engineers designing SAGE have had to think up a different solution for each hazard. Thick clouds of sulfuric acid at 40 miles up explain why the planet's surface is invisible from Earth. As the lander parachutes down, it also has to contend with lightning and withstand winds up to 200 mph.

At an altitude of about nine miles, well below the cloud decks, SAGE finally begins to take pictures of the surface. So few photographs exist of Venus (all taken by the

Venera landers) that every image of the surface will be precious. But aside from showing impressive volcanoes, the landscape shots might be pretty blasé. There are no vistas of lakes or forests, and the air will be hazy—a dreary low light like the fifth rainy morning in a row. The thick atmosphere absorbs high-frequency blue light, so the resulting colors, or rather color, of the surface will be both dull (a kind of rusty yellow) and intense (relentless, unbroken).

At eight miles above the surface, according to JPL planetary scientist Suzanne Smrekar, the carbon dioxide in Venus' atmosphere becomes so dense that it turns "supercritical." Supercritical carbon dioxide is a gas-liquid mix that can eat through metal, and SAGE is designed to keep this nasty stuff from entering the sealed vessel.

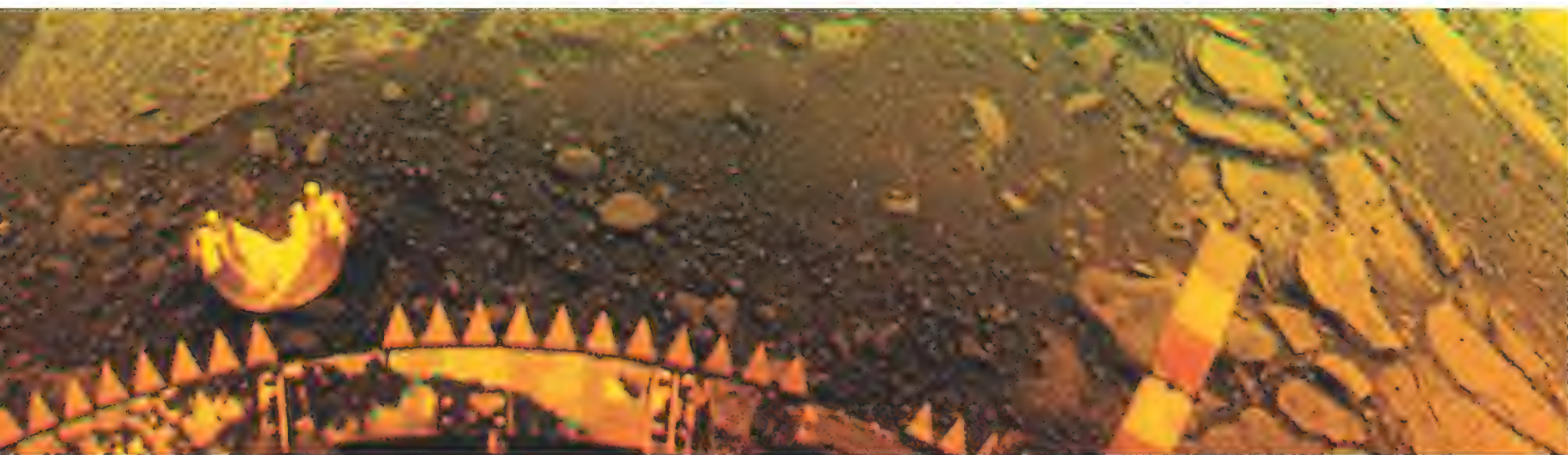
For protection from the crushing atmospheric pressure—1,300 pounds per square inch—the lander will be roughly spherical, the strongest geometric shape. SAGE's core—where the computer circuits are housed—will be surrounded by an inner titanium pressure vessel. The one redeeming quality of the heavy atmosphere is that it cushions the lander's descent. Terminal velocity on Venus is a leisurely 25 mph—so slow that the parachute is no longer needed after the spacecraft is 42 miles above the surface.

There is no upside to the broiling heat, however. "Temperature is the thing that will kill you the quickest," says Smrekar. To protect circuits and batteries, she and



THOMAS TSYMBAL/WWW.BURAN-ENERGIA.COM (2)

The identical Venera 13 and 14 landers (this engineering model is on display in Kaluga, Russia) had arm-like extensions (right) for drilling into the soil.



others are testing advanced insulation materials, like lithium nitrate, a kind of salt that absorbs heat as it melts from a solid to a liquid. This “phase changing” material could be sandwiched between layers of other insulators for extra protection.

As for where SAGE might land on Venus, in some ways it doesn’t matter. Four-fifths of the planet is volcanic plain, with weather more uniform than the Sahara. Venus has no axial tilt, so its poles get little light, and it rotates slower than most people walk, just once every 243 Earth days, exposing whole hemispheres to the sun for weeks. The forecast for Venus is always the same, day or night, equator or antipodes, on the sunny side or on the side facing black space: 850 degrees Fahrenheit, high pressure.

Nevertheless, scientists have diligently scouted landing sites, because wherever SAGE touches down, it will remain. Unlike the recent Mars rovers, the Venus lander will have no wheels or locomotive apparatus of any kind—a mobile explorer would have been too expensive and wouldn’t have gotten far in just a few hours anyway.

The SAGE team has proposed landing on the slopes of Mielikki Mons, a volcano 200 miles wide but just 4,800 feet high. That low grade is typical of Venusian volcanoes, which are like Hawaiian volcanoes in that they ooze lava rather than erupt explosively, building up a massive mountain over time. Based on recent imaging of the region around Mielikki Mons by Europe’s Venus Express orbiter, scientists think the volcano might have recently been active.

Lava flows have shaped the Venusian landscape the way plate tectonics have shaped Earth’s, and the lander will spend much of its short life sampling the terrain

for clues about Venus’ past. Lasers from two portholes above the sphere’s waist will zap the soil, vaporizing small patches of ground. SAGE will also blast a neutron pulse at the soil, then examine the resulting gamma ray spectrum. Both experiments will tell scientists what minerals and elements the soil contains. Cameras looking out four other portholes will take panoramic pictures and microscopic shots, while other instruments sample the atmosphere.

Perhaps most important of all, SAGE will drill into the surface “weather rind”

.....
As for where SAGE might land on Venus, in some ways it doesn’t matter. Four-fifths of the planet is volcanic plain, with weather more uniform than the Sahara. The forecast for Venus is always the same, day or night, on the sunny side or the side facing blank space: 850 degrees Fahrenheit, high pressure.

to get at the virgin soil underneath. This might prove the trickiest part of the mission, since the drilling arm will be exposed to Venus’ melting heat.

Back in the 1970s, Soviet scientists were shocked by the softness of the weather rind—one Venera probe took just two minutes to drill down an inch. The soft Venusian crust can conceal bits of harder material, however—nuts in the brownie—and robotic drills have been known to struggle with differences in rock density. So the SAGE drill may have to work harder to get to the soil underneath. The depth of the weather rind is in fact one of the things the mission will try to determine.

What scientists really want to know

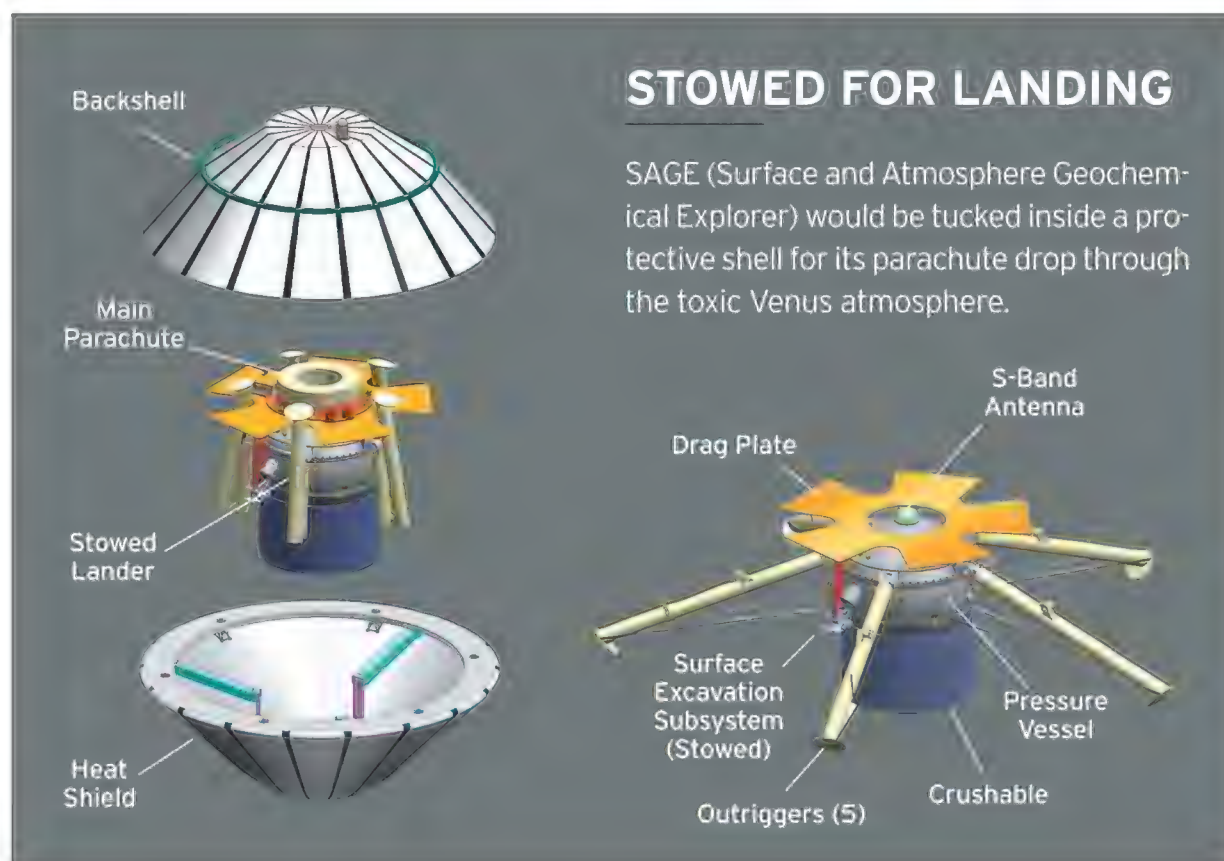
Venera 13’s panoramas of the Venusian rocks (opposite: with distortion removed) are among the rarest of planetary photos.

about Venus—beyond what the rocks are made of—is how the air, volcanoes, and surface interacted to bring the planet to its current boil. In other words, how the planet works as a system, and how that system went awry. “Venus is like the Earth, but has taken a different evolutionary path,” says Esposito. “And everything from its center to the top of the atmosphere plays into and contributes

to those different evolutionary paths.”

Answering the question requires lots of data, and the lander will have to gather its information without human supervision. The pictures and other data will arrive at Earth only after the lander has finished its work on the surface.

To ensure its survival on Venus, the SAGE lander will have to endure grueling trials in several test chambers, some new and some old. NASA’s Venus test chambers from the Pioneer days simulated the surface temperature just fine, but didn’t bother duplicating the carbon dioxide atmosphere, on the assumption that it posed no threat to spacecraft. No one is making that mistake this time around; the new chambers are toxic kilns.



NASA/JPL (2)

So far, Smrekar's team has tested mechanical parts and materials in chambers up to two feet in diameter, sometimes observing them through small windows. (Nothing has failed yet.) To simulate the spacecraft's aerodynamic stability in the upper atmosphere of Venus, the engineers will test it in a wind tunnel. For simulating the lower atmosphere, they will place it in a water tank.

One item of vital concern is the communications antenna. The thick clouds

of degrees higher than that. Semiconductors made of silicon blended with carbon, or gallium blended with nitrogen, might be hardy enough.

Or, the engineers could revive a technology from the 1950s, says Sanjay Limaye, a University of Wisconsin planetary scientist. Vacuum tubes turned out to be impractical for computers for a number of reasons, one being that they blazed so hot that they eventually popped in air that was many degrees cooler. But that

enough "depends on what your perspective is, whether you're a glass half-full or half-empty person," says Limaye. Even three hours gives a spacecraft time to collect data, take pictures, and do a little drilling. But to really understand how the Venus system works over time—that requires longer missions and new technologies.

Insulation won't be enough. Long-duration (weeks-long) landers will require "active" cooling—refrigeration—says planetary scientist Mark Bullock of the Southwest Research Institute in Boulder, Colorado, who heads the team designing SAGE's camera. Future Venus landers would basically be Frigidaires, devoting 70 percent or more of their power to staying cool. They will more than likely need multi-stage cooling: fridges within fridges. The only way to achieve that, says Bullock, is with nuclear power.

Other scientists have speculated beyond rovers to Venus aircraft. To investigate how a planet that rotates so slowly can generate such powerful winds, some suggest penetrating the acid clouds with a Teflon-coated helium-filled balloon. Scientists like Geoffrey Landis at NASA's Glenn Research Center in Ohio have proposed sending an autonomous airplane with the rover. Landis points out the advantages of this one-two combination: The airplane would fly in the cooler upper atmosphere, which is friendlier to electronics. If most of the computer brain

For future Venus landers, insulation won't be enough. Active refrigeration will be required. Basically they'll be Frigidaires, devoting 70 percent or more of their power to staying cool. And they'll likely need multi-stage cooling: fridges within fridges.

around Venus muffle radio waves, and SAGE won't have much lung power to begin with. Nor will it have orbiting satellites to communicate with, as the Mars rovers do. All the lander's data will be beamed up to the spacecraft that dropped it off, and from there relayed to Earth. As with the rest of the SAGE hardware, the communication system has to work in terrific heat.

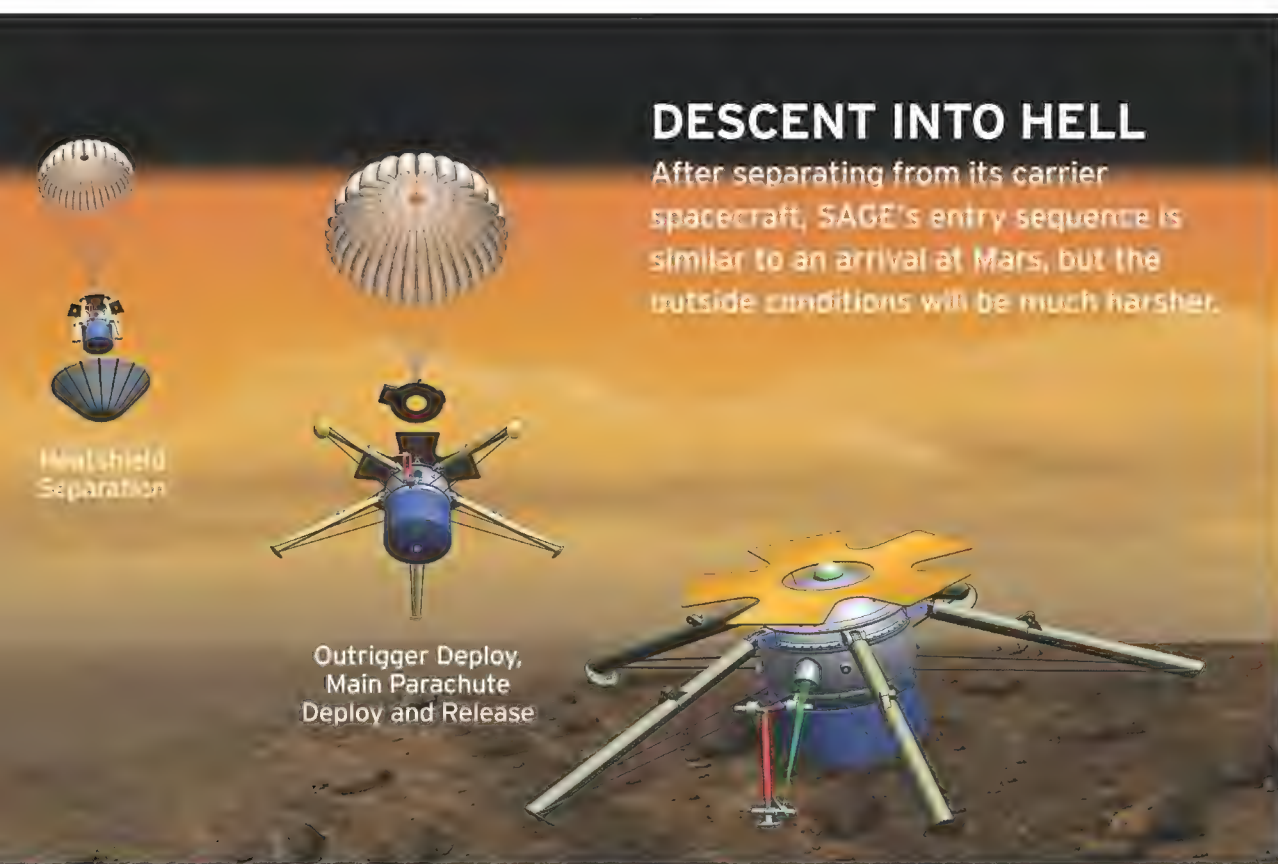
Unfortunately, beyond a certain temperature—about 250 degrees Fahrenheit—commercial silicon electronics crap out, and the temperatures on Venus are hundreds

of degrees higher than that. Semiconductors made of silicon blended with carbon, or gallium blended with nitrogen, might be hardy enough.

"We used to know how to do high-temp electronics when we had vacuum tubes," says Limaye. And even though some of that knowledge has been lost after decades of using silicon circuits, he thinks tubes could be adapted for Venus radios—provided they're smaller than the ones used in 1955 Zenith TVs.

ANY VENUS LANDER launched in the near future will live on the surface five hours, at most. Whether that's long





power were placed on the airplane, it could direct the rover from above.

With these kinds of tools, scientists could really start to unravel the mysteries of Venus: Why the planet doesn't have plate tectonics, what happened to its

All Venus landers, past or (as in this artist's concept) future, tend to assume the same, safe shape: a rugged sphere, made to survive crushing pressures.

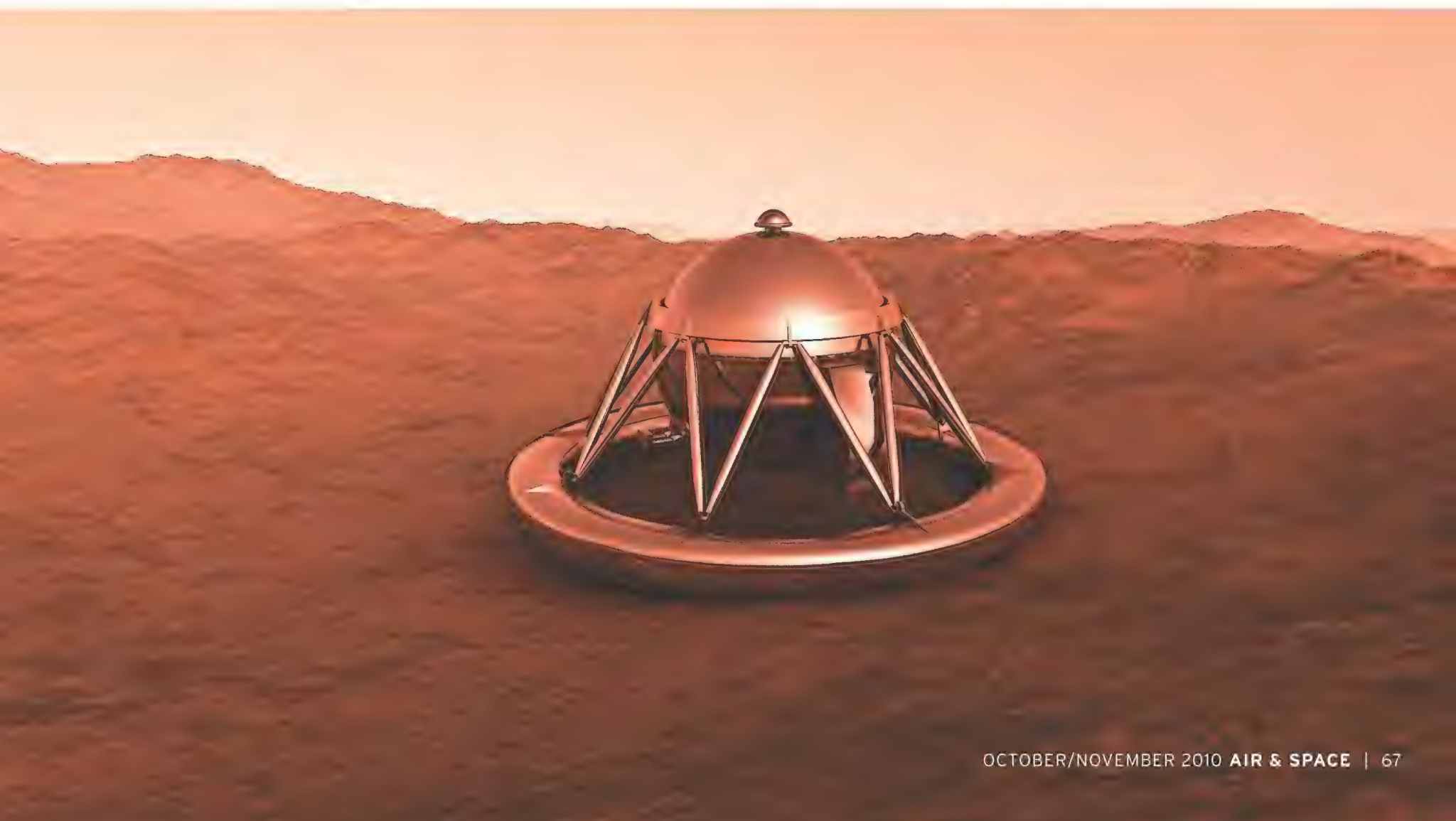
water, and the Big Question: Could the same runaway greenhouse effect happen on Earth? It's still not clear which one of the twin planets is the anomaly, says Smrekar. "We have two end members of [the spectrum of] Earth-like planets, and it will be interesting to see which is more common."

SAGE may not give us all the answers we want, but if its mission is approved, the spacecraft will literally die trying.

The first bytes of data should arrive at mission control—causing the scientists and engineers to erupt in cheers—after the lander has finished its planned work and started to succumb on Mielikki Mons, 24 million miles away. Eventually heat will pierce its inner circuits, kinetic energy will rattle its molecules harder and harder, and hiccups will start to appear in the transmissions.

As Lori Glaze of NASA's Goddard Space Flight Center in Greenbelt, Maryland, envisions it based on work she's done on other Venus mission concepts, the lander's death will not be peaceful—no "Daai-sy, Daaaaai-sy" sign-off, followed by silence. After the batteries shut down, they will continue to bake in the 850-degree heat. Soon after, says Glaze, they will almost certainly explode, and the blast will probably breach the titanium pressure shield around the inner electronics. When the lander stops shuddering, the toxic air will go to work, eating any exposed wires down to the nubs, and the carbon dioxide will bleach any of the lander's decorations (like American flags). All the metals will corrode, and the supercritical CO₂ and acids and ocean-like pressure—all the hellish forces of Venus—will do what they do best, and destroy the lander piece by piece. —

BELOW: TIBOR BALINT/NASA/JPL



Thrills! Chills! MYSTERY IN THE AIR!

IN THE 1930S AND '40S, HEROIC PILOTS ENGAGED ENEMY
AIRCRAFT – EVERY SATURDAY MORNING.

BY REBECCA MAKSEL

WAS IT LINDBERGH AND HIS SOLO FLIGHT ACROSS THE ATLANTIC or dashing stunt pilot Frank Clarke who finally made airplanes the stars of Saturday morning movie serials? In the first serial with an aviation theme, the 1928 *Eagle of the Night* (a title echoing Charles Lindbergh's nickname "Lone Eagle"), Clarke continued a tradition he'd begun in the 1921 silent film *Stranger Than Fiction*, in which he flew a Curtiss Canuck biplane off the roof of a 10-story building. After Clarke blazed the trail, almost 20 aviation-themed serials were made. Many of the kids who watched the Saturday morning thrillers would have those scenes in mind when they trained a few years later for aerial battle in World War II.

Nearly forgotten today, movie serials were wildly popular with audiences from the 1910s through the 1950s. The Edison Company produced the first serial (*What Happened to Mary?*) in 1912, and the format's immediate success led to dozens of copycats, including *The Perils of Pauline*, which helped introduce the cliffhanger as a plot device. Most serials ran for 12 to 15 episodes, letting the plot slowly unfold every week over several months.

Directors of aviation serials were eager to hire real pilots. The 1937 serial *The Mysterious Pilot* starred the record-setter Frank Hawks, billed as the "fastest airman in the world." (He died in 1938, shortly after the serial's completion, when he crashed his Gwinn Aircar.) And the first *Tailspin Tommy*, in 1934, starred Maurice "Loop-the-Loop" Murphy (world-record holder for 120 consecutive loops), a stunt pilot from Howard Hughes' 1930 film *Hell's Angels*.

But the serials' realism didn't extend to aircraft:

A single scene might feature an actual airplane, a model, and stock footage—all of different aircraft.

The era of serials featuring a dashing aviator came to an end in 1952, with Columbia Pictures' *Blackhawk*. While less than 10 percent of Americans had taken even one commercial flight by then, putting pilots on the big screen no longer seemed the stuff of adventure. And so, to recapture the same wonder inspired by early aviation, serial storylines turned to space pilots and interplanetary travel.

Ace Drummond

Based on a comic-strip representation of American World War I ace Captain Eddie Rickenbacker, the character of Ace Drummond is as suave a hero as you'll find in aviation serials. Drummond, writes Rickenbacker biographer W. David Lewis, "was essentially a projection of Rickenbacker's inner vision of himself, living out a fantasy life based on his own



The malevolent Dragon kills unsuspecting pilots with bolts of electricity – sent through their radios – in the 1936 serial *Ace Drummond*. The serial had a fan in Amelia Earhart, who drove to California's San Fernando Valley to watch filming of a dogfight sequence.



Over 15 episodes, Captain Midnight survived bombs, fire, near drowning, and more, before delivering criminal mastermind Ivan Shark to the police – a departure from the comic strip, in which Shark was devoured by a polar bear.

experiences and his faith in technology as the master key to progress.” John King, a vocalist who bursts into song during each installment, plays Drummond in this 1936 serial, in which an evil mastermind known as “the Dragon” tries to drive International Airways and its Clipper Ship air service out of Mongolia. “For movie audiences at the time,” says Mark Taylor, the motion picture archivist at the National Air and Space Museum, “the Clippers represented the leading edge of air transportation, similar to showing the Boeing 747 or Concorde in movies of the 1970s and 1980s. In both cases, these aircraft represented the epitome of luxurious long-range air transportation.”

BEST LINE:

Ace Drummond to Peggy Trainor:
“We’re gonna crash! Duck under the cowling!”

Sky Raiders

In this 1941 serial, pilots in a World War I daredevil squadron, the Sky Raiders, have reorganized as aircraft manufacturers under the leadership of Captain Robert Dayton, their former commander. They’ve developed a pursuit ship (which appears to be some kind of modified Ryan with a Ranger engine) and a bomber that is *very* loosely based on the Bell XFM-1/YFM-1. Ruthless international spy Felix Lynx is determined to obtain both for an unnamed foreign government. He’s aided in his quest by the use of a Kellett KD-1 autogiro, which he keeps parked on the roof of his luxurious penthouse office for fast getaways.

“Autogiros were much in the news for rooftop operations the year before this was released,” says Roger Connor, the Museum’s vertical-flight curator. “Given that this was a Universal production, they had ready access to newsreel footage to splice in. [There was a lot of] attention surrounding Post Office autogiro airmail trials, most notably in Philadelphia—which also featured a KD-1, and which may be the one seen in the serial.”

BEST LINE:

Captain Robert Dayton to Mary Blake, his gal Friday:
“When I come back, remind me to fire you.”

Junior G-Men of the Air

The Dead End Kids and the Little Tough Guys save the day in this 1942 serial celebrating the efforts of “wide-awake, energetic young civilians” who expose a nest of dangerous fifth columnists working within the United States. “Ace” Holden, played by actor Billy Halop, leads a gang of scruffy juveniles who work at his father’s junkyard. His brother, Eddie (Gene Reynolds), the brains of the group, has designed a muffler for airplane engines; he plans to give the technology—which would enable entire bomber squadrons to fly silently—to the U.S. government. But the treacherous Black Dragon Society (“a dangerous alien organization working right here in our very midst, to pave the way for the conquest of the United States”) has other plans. A dated biplane, possibly a 1930s Great Lakes trainer, makes an appearance as the Black Dragon Society’s “hot new pursuit ship.”

BEST LINE:

Ace Holden: Where are you takin’ me?
Bad guy: Up to about 12,000 feet – and then you’re going to try a little cloud walkin’.

COURTESY BILL ALLEN/ALLEN AIRWAYS COLLECTION

Captain Midnight

Derived from the popular radio program of the same title, which was a favorite with the U.S. Army Air Corps, Captain Midnight was the code name of Captain Red Albright, a former World War I Army pilot engaged in a "one-man war against crime." In this 1942 serial, scientist John Edwards invents a range finder and becomes a target of the evil Ivan Shark, who heads a mercenary organization. Captain Midnight comes to Professor Edwards' rescue, of course, with his trusty sidekicks Ikky and Chucky. Shark flies a Stinson Model A Trimotor, an aircraft ideal for a villain: its double-tapered wing and forward-raked windscreen gave it a strikingly sinister appearance.

BEST LINE:

Bad guys as they enter Professor Edwards' home:
"The job will be easy if there aren't any screaming women about."

The Adventures of Smilin' Jack

Although the comic strip was loosely based on the dashing air racing pilot Roscoe Turner, the movie serial made do with a former child model for Buster Brown shoes. In this 1943 serial, Smilin' Jack works with the Chinese government to stop the Black Samurai, a covert Japanese spy ring run by Fraulein Von Teufel (German for "Miss Devil"), from learning the route from China to India through the fictional mountain kingdom of Mandan.

To outsmart a Black Samurai agent bent on hijacking their Fairchild 24, Smilin' Jack and Janet Thompson use Pig Latin; little do they know that more agents follow closely behind in a Lockheed Vega. In a nice use of stock footage, Smilin' Jack is escorted into Chungking by the Flying Tigers.

BEST LINE:

In an effort to console the Mandan governor, whose first trip out of the kingdom isn't going according to plan, Gertrude Muller points out, "Well, it surely hasn't been monotonous. Shot down by Japs, imprisoned in a sub tender, and finally escaping in this eggshell."

Hop Harrigan

In this post-Hiroshima serial from 1946, Hop Harrigan and sidekick mechanic Tank Tinker run a small charter service at Blakefield Airport. Although they've just landed a cushy job hauling gold from the nearby Atlas Mine, they decide to subcontract

it in order to fly mad scientist Dr. Tobor to his mountain lair, where he has developed a new power source more potent than atomic energy. They'll soon find out that the villain—the oddly named "Chief Pilot"—is also after the deadly ray. With this ray, Dr. Tobor powers his lightning-fast Mystery Plane (a PT-26 with the prop removed). It's doubtful that Hop and his employer, Mr. Arnold, will be able to keep up in their respective Stinson 108 and Bellanca 14.

BEST LINE:

First bad guy: Who fired those shots?

Second bad guy: Somebody with a gun.

Before starring in films, Frank Hawks was a flying instructor during World War I, and spent his postwar years barnstorming in the United States and Mexico and setting dozens of speed records.



Sightings

PICTURES WORTH A SECOND LOOK



"I BECAME MESMERIZED by the sight of airplanes mounted on poles," says Los Angeles-based photographer Chad Slattery, who in 1986 began photographing them during his work travels. "It made me think of butterflies you see in shadow boxes—pinned down forever, but

carefully arranged to mimic flight." Slattery, a frequent contributor to *Air & Space*, has made about 150 photographs of static displays at museums, colleges, VFW halls, city parks, and, of course, military bases, such as the three shown here. In 1994, he shot

a North American F-86D Sabre (above, being flown by a mannequin) at Davis-Monthan Air Force Base in Arizona; in 1996, a McDonnell F-4 Phantom (opposite, bottom) at Hill Air Force Base in Utah; and in 1992, a Republic F-105 Thunderchief (opposite, top,



foreground) with a General Dynamics F-16 Fighting Falcon at Langley Air Force Base in Virginia.

"At some point I got tired of the forensic approach—shooting just to add them to the collection," says Slattery. "I started photographing them with shift lenses,

which are intended for architectural photographers who want to minimize converging vertical lines. When that got boring, I began photographing them at night with whatever light fell on them. That's how I got the eerie green light at Langley."

Mounting an airplane keeps it above the reach of souvenir hunters and vandals, or children looking for a jungle gym. Openings larger than a quarter are blocked with a screen to prevent birds from nesting. Engines and cockpit instruments are removed.

And the mount seems to give the airplane life again. "It honors the plane to show it in a flying position," says Slattery, "pointed towards the sky, forever aimed back at its natural habitat, like it could fly again if someone would just undo these gosh-darned bolts."

Reviews & Previews

BOOKS, MOVIES, CDs, STUFF TO BUY

Battle of the Blimps

A new book details how U.S. Navy airships turned the tables on German submarines menacing the Atlantic during World War II.



Forgotten Weapon: U.S. Navy Airships and the U-Boat War

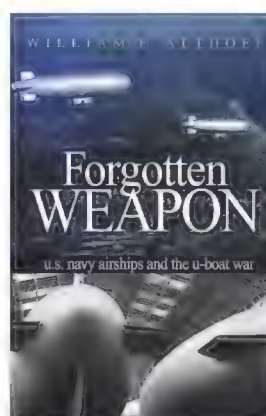
by William F. Althoff. Naval Institute Press, 2009. 419 pp., \$49.95.

THIS BOOK DOCUMENTS in careful—and occasionally painful—detail the lighter-than-air forces in the U.S. Navy during World War II. The author conducted much of his research while he was a Ramsey Fellow at the National Air and Space Museum, so he was able to draw from a treasure of documents and records, largely the George H. Mills and Garland Fulton collections.

While most blimp histories devote a lot of attention to Admiral Charles Rosendahl, Althoff wisely attributes

much of the eventual success of the blimps in the Atlantic battle against Germany's submarine force to the National Defense Research Committee (NDRC). Unlike Germany, which failed to link its industries with academia, the United States formed a body of scientists with a broad mandate to expand research and share discoveries to get the newly developed technologies where they could do the most good. In laboratories and research facilities, U.S. professors went to war.

The author clearly documents the disfavor that fell upon airship supporters like Rosendahl and Mills,



Wartime airship operations extended to the south Atlantic, including an airfield in Santa Cruz, Brazil (above).

whose efforts to obtain even the most meager resources were thwarted by a Navy that had turned against the airship. After a series of tragic accidents in the period

between the wars decimated its rigid airship fleet, the Navy was through with the technology. Airships were not only dangerous, they were also large, cumbersome, slow—and expensive.

But the NDRC gets a nod for sponsoring technologies that at least

Continued on page 76

TO ORDER THESE BOOKS FROM SMITHSONIAN SHOPS, CALL (202) 357-1387 OR -1388.

HARBOR FREIGHT TOOLS

Quality Tools at Ridiculously Low Prices

FACTORY DIRECT TO YOU!

How does Harbor Freight Tools sell high quality tools at such ridiculously low prices? We buy direct from the factories who also supply the major brands and sell direct to you. It's just that simple! Come see for yourself at one of our 330 STORES NATIONWIDE and use this 20% OFF Coupon on any of our 7,000 products. We stock Automotive products, Shop Equipment, Hand Tools, Tarps, Compressors, Air & Power Tools, Material Handling, Woodworking Tools, Welders, Tool Boxes, Outdoor Equipment, Generators, and much more.

NOBODY BEATS OUR QUALITY, SERVICE AND PRICE!

- ✓ We Have 10 Million Satisfied Customers
- ✓ We Buy Factory Direct and Pass the SAVINGS on to YOU!
- ✓ Shop & Compare Our Quality Brands Against Other National Brands
- ✓ Thousands of People Switch to Harbor Freight Tools Every Day!
- ✓ NO HASSLE RETURN POLICY ✓ Family Owned & Operated

LIFETIME WARRANTY
ON ALL HAND TOOLS!

We Will Beat Any Competitor's Price Within 1 Year Of Purchase!

330 STORES NATIONWIDE

Store Locator: 1-800-657-8001

Shop Online at

HarborFreight.com

SUPER COUPON!

20% OFF

ANY SINGLE ITEM!

Use this coupon to save 20% on any one single item purchased when you shop at a Harbor Freight Tools store. Cannot be used with any other discount or coupon. One coupon per customer. Coupon not valid on any of the following - prior purchases, gift cards, Inside Track Club membership or Extended Service Plans. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in store in order to receive the offer. All Campbell Hausfeld products are excluded from this offer. Valid through 1/28/11.



19824259

Get More Coupons at HarborFreight.com/airspace

3000 LB. CAPACITY LIGHTWEIGHT ALUMINUM RACING JACK

Item 91039 shown

U.S. GENERAL

LOT NO. 91039/67408

\$59⁹⁹

REG. PRICE \$99.99

53615449

CENTRAL PNEUMATIC® 2 HP, 8 GALLON, 115 PSI PORTABLE AIR COMPRESSOR

LOT NO. 95386/40400/67501

\$89⁹⁹

REG. PRICE \$139.99

SAVE \$50

Item 95386 shown

40294308

11 DRAWER ROLLER CABINET

STOREHOUSE LOT NO. 67421

INCLUDES:

- 6 Drawer Top Chest
- 2 Drawer Middle Section
- 3 Drawer Roller Cabinet

\$139⁹⁹

REG. PRICE \$299.99

SAVE \$160

62128152

SAVE \$40

HARBOR FREIGHT TOOLS - LIMIT 1

This valuable coupon is good anywhere you shop Harbor Freight Tools (retail stores, online, or catalog). Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in store, or with your catalog order form or entered online in order to receive the offer. Valid through 1/28/11.

OSCILLATING MULTIFUNCTION POWER TOOL

LOT NO. 67256

\$29⁹⁹

REG. PRICE \$59.99

78097508

10/25 AMP, 6/12 VOLT BATTERY CHARGER/ENGINE STARTER

LOT NO. 66783

\$25⁹⁹

REG. PRICE \$59.99

SAVE 56%

84800986

12 VOLT MAGNETIC TOWING LIGHT KIT

HAUL-MASTER®

LOT NO. 96933/67455/94413

\$9⁹⁹

REG. PRICE \$29.99

SAVE 66%

Item 96933 shown

95508867

CHICAGO Electric Power Tools

17 DIFFERENT ATTACHMENTS AVAILABLE IN OUR STORES!

CUT METAL **CUT DRYWALL** **CUT PLASTIC** **PLUNGE CUTTING** **CUT FLOORING**

SAVE 50%

78097508

13 PIECE SCREWDRIVER SET

Pittsburgh® LOT NO. 1847

\$4⁹⁹

REG. PRICE \$11.99

SAVE 58%

77886356

80 PIECE ROTARY TOOL KIT

DRILL MASTER

LOT NO. 97626

\$6⁹⁹

REG. PRICE \$19.99

SAVE 65%

26491563

HARBOR FREIGHT TOOLS - LIMIT 1

This valuable coupon is good anywhere you shop Harbor Freight Tools (retail stores, online, or catalog). Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in store, or with your catalog order form or entered online in order to receive the offer. Valid through 1/28/11.

HARBOR FREIGHT TOOLS - LIMIT 1

This valuable coupon is good anywhere you shop Harbor Freight Tools (retail stores, online, or catalog). Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in store, or with your catalog order form or entered online in order to receive the offer. Valid through 1/28/11.

HARBOR FREIGHT TOOLS - LIMIT 1

This valuable coupon is good anywhere you shop Harbor Freight Tools (retail stores, online, or catalog). Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in store, or with your catalog order form or entered online in order to receive the offer. Valid through 1/28/11.

SAVE UP TO 80% TODAY - SHOP ONLINE at HarborFreight.com

doubled the effectiveness of the blimps in stopping the U-boats from inflicting carnage. Radar gave blimp crews the edge over the subs at night, forcing the U-boats underwater when they were supposed to be on the surface running on their air-breathing diesel engines and sinking merchantmen. By war's end, the submarine weapon had been blunted, and blimps ranged over nearly half the planet.

Don't expect an endless string of stirring war stories. This is not a book to curl up with. Its pages are filled with the details of memoranda and correspondence, rosters of various organizations and their equipment. For airship buffs, it's the definitive compilation of data. For the average reader, it's sometimes a bit of a slog.

■ ■ ■ GEORGE C. LARSON, THE FOUNDING EDITOR OF *AIR & SPACE/SMITHSONIAN*, WROTE *THE BLIMP BOOK*.

>>> Postcards From the Front

Dogfight: War in the Skies

Osprey Publishing, 2010. 40 postcards. \$15.

THIS BOXED SET of postcards, each one unique, is drawn from art featured in Osprey Publishing's many aviation history books. The postcards depict aircraft in action, from the bi- and triplanes of World War I to the streamlined Luftwaffe fighters of World War II. Order at amazon.com or barnesandnoble.com.



New! >>> Online Book Club <<<



TO GIVE OUR READERS the opportunity to dig deeper into books about aviation and space, *Air & Space/Smithsonian* has started an online book club. The latest selection is *My Dream of Stars* by Anousheh Ansari with Homer Hickam. In 2006, Ansari spent eight days aboard the International Space Station as the world's first female commercial space-flight explorer. *Air & Space* contributor Homer Hickam is the author of the *New York Times* bestseller *Rocket Boys*. Those who would like to participate should read the book in preparation for the online discussion on the *Air & Space* Web site in November. The book's authors will be available to answer questions from readers. For more details on the club, visit airspacemag.com/bookclub.

My Dream of Stars: From Daughter of Iran to Space Pioneer

by Anousheh Ansari with Homer Hickam. Palgrave Macmillan, 2010. 234 pp., \$25.

The following excerpt is from the chapter "At Home Among the Stars."

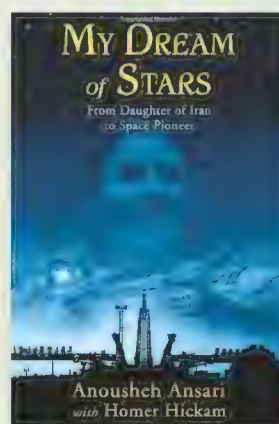
Some of my favorite places are Paris, Star City, the Hawaiian island of Kauai, Cinque Terre on the Italian Riviera, and Yosemite National Park. But I must tell you my favorite place of all is the International Space Station, and in particular my little nook in the Unity airlock attached between the FGB and the Service Module. I was in heaven there because I could play my favorite music and think of my favorite times, all the while enjoying the majesty of soaring over the whole Earth. Within a day, the space station had become a very dear place to me, a place I savored and never really wanted to leave. If it was not for Hamid [Ansari's husband] and my family, I would have gladly signed up to stay another six months, six years, perhaps the rest of my life. This is how much I loved being in space.

The best part was at night when I could see the stars. They were simply unbelievable. It was as if someone had spread diamond dust over a

black velvet blanket. When I was supposed to be sleeping, I put my head to the window and stayed there until the coldness of the glass gave me a headache. As I gazed out, I thanked God again for giving me this experience. I also thanked Him for

letting my inner voice carry out through my blogs and I asked Him to give me the vision to see my path in life and the strength to pursue it. These were the most peaceful moments I had ever experienced in my life and I felt a great source of positive energy. I had such a hard time sleeping

because I kept forcing my eyes open to see the beauty and take it all in. Only a second longer I would tell myself. Then I would tell myself the same thing again. And again.



Excerpted from *My Dream of Stars* by Anousheh Ansari. Copyright 2010 by the author and reprinted by permission of Palgrave Macmillan, a division of Macmillan Publishers Limited.

WARNING: IS YOUR MEMORY FADING?

Breakthrough medical research reveals “forgotten moments” may be caused by “brain starvation”

Be proactive about your brain health. Leading medical researchers reveal discovery that triggers the body's own production of mental 'super fuel' (choline).

Do you remember your first kiss but not where you left your car keys? You're not alone. Millions are discovering that as they age, their short term memory and mental sharpness seem to be slipping. The cause of these inconvenient “gaps” in memory sits deep inside your brain, among the billions of tiny nerve connections. New brain cell growth starts dropping after age 25, and then dramatically after 50, starting a downward spiral that can lead to the embarrassment and frustration of age-related memory loss.

Downward Memory Spiral is Reversible

Studies have shown that the efficiency of brain cells declines after years of free radical damage and stress. It was long believed that as we got older, memory problems were inevitable. But medical experts have revealed that **the downward memory spiral may be helped.** Compelling new research shows that there's a simple way to stimulate new brain cell growth that can boost your memory, improve your focus and restore your mind's mental sharpness.*

Achieve Peak Brain Performance

Challenging mental games aren't enough to build a better brain. Your mind is the most complex and demanding organ in your body. It's also a high-performance supercomputer that requires the right chemical “foods” to perform at its peak.

One of the brain's most important nutrients is choline. Choline is a substance in our body that our brain desperately



Are you starving your brain?

If you have experienced one or more of these symptoms, you may benefit from Neurostin™.

- ☒ Do you forget names or dates?
- ☒ Do you sometimes get confused?
- ☒ Do you find it difficult to do more than one thing at a time?
- ☒ Do you often forget why you walked into certain rooms?
- ☒ Do you find it hard to concentrate?

needs to help manufacture new cells and improve vital neurotransmitters (the basic processes of thinking and memory). Until now, it was believed that there was no way to safely and naturally produce this remarkable mental “superfuel.” But after years of extensive research and testing, microbiologists and brain researchers in the U.S., Europe and Israel have developed a way to help boost choline production.

The ingredients in Neurostin help support memory, and help clear “brain fog”.*

Support Memory and Alertness

The Neurostin® formula is safe and contains no stimulants, ephedra or caffeine. Specific brain-boosting ingredients help improve the synthesis and transmission of neurotransmitters and help improve mental clarity.* This exciting breakthrough discovery is now available in a **time-release capsule** called Neurostin® Complex-Memory Pill that is available without a prescription to anyone looking to sharpen their memory. Neurostin® contains a unique combination of antioxidants, botanicals and nutrients to support critical processes for good cognitive function.

Protect Your Memory Now Before It's Too Late

Why wait until your lack of focus or forgetfulness creates an unsafe situation? Today it was your reading glasses, but tomorrow it could be the stove. You forget a phone number today, but tomorrow it could be where you parked your car at the mall.

Just as important is the personal toll that a fading memory can take on your family and friends. Don't you owe it to them and your future to take your brain's fitness as seriously as you do your heart health? It couldn't be easier. You can get back the mental sharpness and focus you had when you were years younger! Act today and unlock your mind's true potential!

Having Trouble Finding Neurostin?

The makers of Neurostin® are so confident that they want to offer you a 30-Day Risk Free Trial, so you can experience the results firsthand.

To get your trial supply of Neurostin® risk free, for just a small shipping and processing fee call 888-221-3113.



**Call 888-221-3113 Today
For Your 30 Day Risk-Free Trial
of Neurostin™ Complex-Memory**

Mention Promotional Code NU100105

www.NeurostinDirect.com



How Neurostin™ Works

- Provides the building blocks of nerve cell membranes to promote optimal brain cell activity
- Assists in the production of acetylcholine, a vital component for improved mental performance
- Helps relax blood vessels to increase blood flow for maximum nutrient and oxygen delivery
- Helps dispatch antioxidants which inhibit free radical oxidation of nerve cell membranes

* These statements have not been evaluated by the FDA. This product is not intended to treat, diagnose, cure, mitigate or prevent any disease. Return postage may be required. Neurostin is not endorsed, associated or affiliated in any way with university, hospital or research facility.

FREE

Audio/Video Catalog



Just call Crutchfield for the latest in top brand A/V gear.

- One-on-one expert help to find the right gear for you
- Free shipping on most orders



For your free A/V catalog or to talk to a Crutchfield expert, call:

1-800-316-1376

or www.crutchfield.com/air

CRUTCHFIELD

MATHTUTORDVD.COM
Press Play For Success

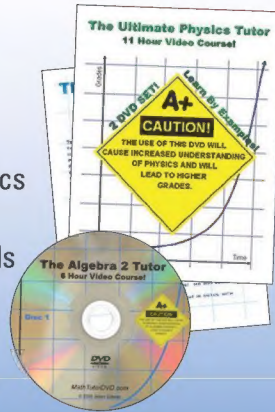
**Having Math Problems?
WE CAN HELP!**

SUBJECTS:

- Basic Math
- Word Problems
- Pre-Algebra
- Algebra 1 & 2
- Advanced Algebra
- Geometry
- Trig/Pre-Calculus
- Calculus 1, 2, 3
- Physics 1, 2, 3
- Probability & Statistics
- Unit Conversions
- TI Calculator Tutorials

**AVERAGE COURSE
LENGTH: 8 HOURS
MOST COURSES COST
ONLY \$26.99**

Visit
www.MathTutorDVD.com
to watch all courses
online 24/7



#1 Rated Math & Physics Tutorial DVDs

Our courses are used in public schools, universities, and libraries!

Raise grades or your money back
877-MATH-DVD

www.MathTutorDVD.com

*Protect YOUR BACK —
Protect YOUR MONEY*

The new Rogue Wallet does BOTH.
Fits into your front pants pocket with style.

Only \$29.99



THE

ROGUE WALLET,

the only wallet with a revolutionary curved edge, is designed to fit comfortably in your front pocket.

Learn more or order online at

roguewallet.com

or call 800-786-1768, ext. 14.

Credits

Fire and Ice. Leonard Scotty served at Harlingen, Sheppard, Ellington, Keesler, Castle, and Vandenberg Air Force Bases and Takhli Air Base in Thailand. He ended his civilian career at the University of Texas Institute of Texan Cultures.

He Shot California. Vickey Kalambakal, a graduate of the University of California at Los Angeles, is a Southern California freelance writer.

Jump. Fly. Land. Carl Hoffman is the author of *The Lunatic Express: Discovering the World Via...Its Most Dangerous Buses, Boats, Trains, and Planes*. Visit his blog at thelunaticexpress.com and follow him on Twitter @lunaticcarl.

Flying Bathtubs Sell Like Hotcakes. Giles Lambertson became acquainted with the Aeronca C-2 because his father learned to fly in one.

Brooklyn's Jewel: Floyd Bennett Field. David Shaftel, a writer from New York City, is now stationed in Mumbai, India, as a correspondent for the New Delhi-based Tehelka group of publications.

Throttle Down. Tom Harpole, a writer in Avon, Montana, wrote a story about cropdusting, "That Old-Time Profession," for the Feb./Mar. 2007 issue.

Just Shoot Me. James Dunaway got into the magazine business at age nine, selling door to door in New York City. He is now the editor of *American Track & Field*. This is his first story for *Air & Space*.

Sidewinder. Frequent contributor Preston Lerner wrote "Black Day at White Sands," a look back at the McDonnell Douglas DC-X, for the August 2010 issue.

Forbidden Planet. Sam Kean is the author of the *New York Times* bestseller *The Disappearing Spoon: And Other True Tales of Madness, Love, and the History of the World from the Periodic Table of the Elements* (Little, Brown, 2010).

Thrills! Chills! Mystery in the Air! Associate editor Rebecca Maksiel is a fan of Captain Midnight.

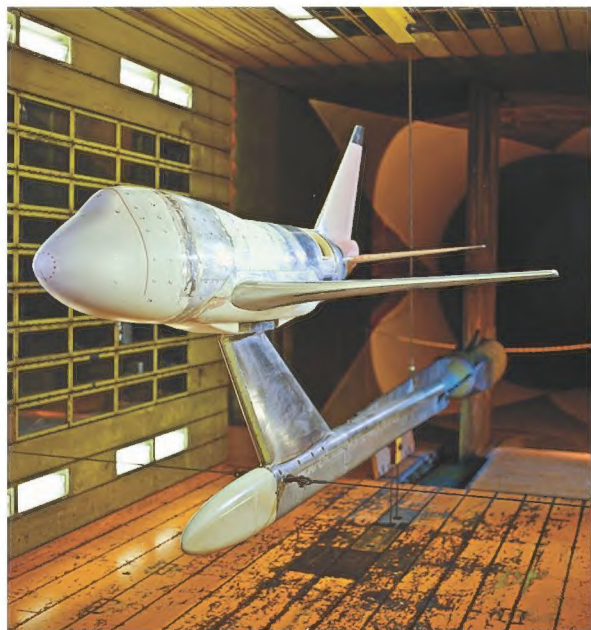
Forecast

IN THE WINGS AND ON THE WEB...

COMING TO AIR & SPACE

Gold Star Upgrade

What does it take to transform a retired 747 into an airborne observatory?



NASA/AMES RESEARCH CENTER

Before performing surgery to install a telescope in a Boeing 747-SP, NASA tested a model in the Ames wind tunnel.

Not Your Grandfather's Zeppelin

For the best views of California's coast, travel by airship – in a Zeppelin, brought to you by a descendant of the famous count.

The Other Gulf War

More than 100 aircraft answered the call to assist in clean-up efforts after the Deepwater Horizon operation switched to fill 'er up in the Gulf of Mexico.

ONLY ON AIRSPACEMAG.COM

Got a hankering for Oshkosh in October?

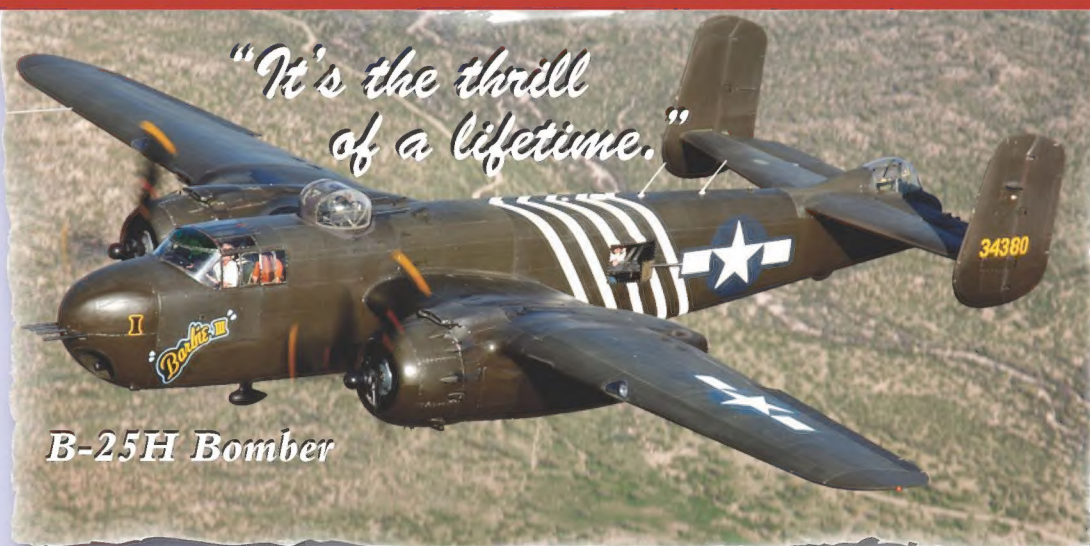
Stroll through our photo gallery to whet your appetite for next year.



CAROLINE SHEEN

At the 2010 fly-in at Oshkosh, Ben Scott's 1945 Grumman Widgeon was named Grand Champion in the seaplanes category.

THE PERFECT HOLIDAY GIFT



B-25H Bomber

HISTORY FLIGHT

TO EDUCATE.
TO HONOR. TO INSPIRE.

HISTORY FLIGHT IS A 501(c)(3) NON-PROFIT FOUNDATION. ALL FLIGHTS ARE TAX DEDUCTIBLE AND FUND ON-GOING MISSIONS TO BRING OUR MIA SERVICEMEN HOME FROM BURIAL SITES IN REMOTE BATTLEFIELDS OF WWII. VISIT OUR WEBSITE FOR COMPLETE DETAILS ON OUR "LOST GRAVES" MISSION TO TARAWA.

AT6-Texan



\$50 off

ALL FLIGHT PACKAGES if purchased by 12/15/10.

ASK ABOUT OUR 8x10 GIFT CERTIFICATES SUITABLE FOR FRAMING.

World War II Warbird Flights

Join our 2011 "Until They're Home" Barnstormer Tour, flying out of regional airports east of Denver (CO). Tax deductible flights can include aerobatics and combat maneuvers.



Stearman Biplane

CALL TODAY 1.888.743.3311 • HISTORYFLIGHT.COM

NEW! Vantage Vue Weather Station

Rugged. Accurate. Reliable.
And a Great Price.



ISO 9001 CERTIFIED COMPANY

An easy-to-install station from the company that sets the standard in quality.

- Wind, rain, temperature, humidity, barometric pressure and much more
- Unique Weather Center function provides historical data for each weather variable
- Solar-powered external sensors
- 1,000 ft. (300 m) wireless transmission is up to 3x farther than the competition
- 2.5 second updates are up to 10x faster than competing stations

\$395



AIR1010

www.vantagevue.com • 1-800-678-3669

DAVIS
Davis Instruments

Birth of the Clippers

GLENN L. MARTIN made his reputation building big bombers for the air forces of the world. In 1933, he won the Collier Trophy for his spectacular B-10, renowned for being speedier than the fighters of its day. Juan Trippe made his reputation building Pan American World Airways into an airline that, for a time, was the United States' unofficial flag carrier. Trippe and his group of investors initially aimed their expansion south toward Latin America because they were able to maneuver business and politics to their advantage there. But Trippe's real objective was the lucrative transatlantic routes, which the British government and the steamship operators were blocking.

Pan Am had bought Sikorsky's S-40, an awkward, strut-braced contraption of an airplane that the airline's technical advisor, legendary aviator Charles Lindbergh, openly mocked. Trippe wanted a much bigger airplane, which could span both the Atlantic and the Pacific, and two giants of the industry stepped up: Glenn Martin and Igor Sikorsky. Pan Am's chief engineer, André Priester, wrote the demanding specification. The required range was 2,500 miles against 30-mile headwinds. Trippe split the order evenly, taking three from Martin and three from Sikorsky.

Sikorsky offered the S-42, an improvement over its predecessor, certainly, but able to cross the Pacific to Hawaii only if its interior were stripped and crammed with fuel tanks. Although Martin was late delivering the M-130, which was priced at a

staggering \$417,000 (at a time when a Douglas DC-2 went for \$78,000), it was worth the wait: The M-130 was the airplane that would open the Pacific for Pan Am. And in October 1935, just 75 years ago, Pan Am accepted delivery of its first one, named the *China Clipper*. On November 22, the airplane left Alameda, California, on the first scheduled airmail run across the Pacific,

M-130 could carry 32 passengers; crews were uniformed in the manner of staff on an oceanliner, and meals were served in a dining room.

Martin knew that if he delivered only the three M-130s Trippe ordered, he'd lose money, but he wanted to break into the commercial aircraft business, and Douglas Aircraft Company had a lock on it. Martin may have expected to have

a leg up on any competition when Trippe was ready for his next generation of giant flying boats. He was to be bitterly disappointed.

Trippe did invite designs for a follow-on transport and awarded the contract for six aircraft to Boeing, whose 314 was even bigger and more powerful than the M-130, and had elegant compartments and spacious lounges. At the end of the 1930s, having applied his wiles and plied his political connections for a period of years, Trippe, by agreeing to some British and European conditions, finally concluded a deal to serve the Atlantic. The 314 began flying those routes in 1939, but with a war coming, Pan Am's expansion plan had to change.

Pan American named the first Sikorsky S-40s and -42s "Clippers," part of a constant effort to link the aircraft with the fast 19th century sailing vessels of that name, but it wasn't until Martin's M-130 *China Clipper* debuted that the phrase took off among the public. And it stuck: After that, all Clippers were China Clippers. And right up until the airline's collapse in December 1991, its air crews used the call sign "Clipper" to identify their flights.

■ ■ ■ **GEORGE C. LARSON, MEMBER, NAA**



Thousands watched the *China Clipper* as it set off on the first trans-Pacific airmail flight on November 22, 1935.

landing in Manila, the Philippines, on November 29 some 8,000 miles later.

The trans-Pacific run was a formidable trip, the first leg, 2,400 miles to Hawaii, being the longest. Then came Midway, Wake, Guam, Manila, and Hong Kong. The passengers enjoyed lavish quarters and equally lavish treatment by the onboard staff. The